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THE JOURNAL OF GAS LIGHTING AND WATER SUPPLY.

VOL. CXXXI.

JULY TO SEPTEMBER, 1915.

LONDON:
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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

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VOL. CXXXI., No. 2721.] TUESDAY, JULY 6, 1915. [67TH YEAR.

EDITORIAL NOTES.

Revision of Gas Capital Conditions.

EIGHT months ago—to be precise, in the "JOURNAL" for Nov. 3—we published an editorial article on "The War "and Capital-Raising by Statutory Gas Companies." The principal objects of that article were to view, from the standpoint of the unparalleled circumstances in which the country and Europe were then immersed, the probable effects that the situation as it developed would have upon gas securities and prospective capital-raising by gas companies, and to suggest the advisability of certain forms of relief from statutory regulation as to capital issues during the period that normal conditions, through the war, would be affected by the appeals to investors for heavy sums to finance the war, and to prosecute schemes of trade expansion—appeals which would become, with the lapse of time, more competitive in respect of the terms as to returns upon the money. No particular credit is taken for the points made in the article; they were only those that would have occurred to any intelligent person who then seriously endeavoured to forecast the probable financial situation. The progress of events, however, has fully justified the apprehension then shown. The conditions that appeared bad at the time in regard to prospective capital-raising are already—after only eight months—worse than were then foreseen. Many things have happened since last November which have gravely affected the capital-raising position of statutory gas undertakings. Among other events, the Treasury have put an embargo on capital-raising; and consent to new issues has now to be obtained. Coal and oil prices have gone up considerably—to an extent that has caused an increase in price of gas beyond what, in the early stages of the war, it was considered would be necessary, with the result that, in the case of sliding-scale companies, dividends have substantially receded, and the market value of gas stock has depreciated far more than would have been experienced had not the heavy charge for coal come upon the other value-detracting conditions. Superincumbent is the new war loan, which—with its 4½ per cent. interest, the Government guarantee, and the principal maintained intact by the condition as to repayment at par—has set up a new standard of values for all capital. The Chancellor of the Exchequer (Mr. M'Kenna) has himself stated that one effect of this war loan must be to depress the values of industrial securities; and there is no room for cavil as to the correctness of the prognostication. Before the terms of the new war loan were published, and after the effect in dividend reduction of the price of raw materials was known, Tokenhouse Yard was telling a tale of much reduced values, and of a paucity of buyers at even the fairly low reserve prices placed upon the stocks and shares. Stock at par, paying as much as 5½ per cent. at present gas prices, has not all been disposed of. It is safe to assume that, in view of the new war loan, still less would now be taken up. Considering these matters collectively, there must be the feeling, among those who have been observing the trend of things, that the worst has not yet been seen of the depreciation of the industry's capital-raising power, now and in the immediate future, unless the war is shorter than is anticipated, or unless steps are taken by gas administrators, with the aid of Parliament, to ameliorate the position. In saying this, we have, of course, present in mind that the conditions are only temporary and not permanent. But the temporariness, we are afraid, is something that requires a longer measure than is applied within the normal meaning of the term.

The influences in relation to the question under consideration now seem fairly clear. All must realize that the war is going to absorb a large amount of the capital of the country; and the capital-providing capacity of the country will not for some years be restored to what it is to-day, or to what it was only a few months ago. From now onwards, low interest-yielding capital will have no attractions for the investor, with 4½ per cent. obtainable under Government protection. Although, too, Parliament may regulate the price of coal, it must be at a figure at any rate some 3s. or 4s., perhaps rather more, above 1914-15 contract figures; and so the price of gas must inevitably continue higher and dividends lower than previously. Other expenses—rates and taxes, labour charges, and provision, under the obligations shouldered at the beginning of the war, for men at the front and their dependants—will all for some time be higher; and there will be larger deductions for income-tax from the dividends and interest of investors. This is a sufficiently serious, and to the investors a repellent, state of things; and its effects are cumulative, in respect of capital-raising, for an industry restricted to standard prices and standard dividends, and with cast-iron regulations as to capital issues. Beyond this, the Treasury blockade to capital-raising during the war, and for a period after, means that, when the blockade is raised, there will be a perfect shoal of commercial and manufacturing enterprises competing for the favour of investors—investors who in large part will have denuded themselves of capital through their patriotism and the high rates of interest and security offered them by the Government—and competing on terms to which those who require capital will have to submit in order to satisfy their needs. There can be no question that this is the position that has to be faced; and it is no use burking its consideration.

Any gas director who sits down and tries to picture the capital-issuing conditions of the future in the light of present circumstances, with a war loan paying 4½ per cent. and redeemable at par by the Government—a condition of things which may continue to 1945—should have no difficulty in seeing that his capital-raising powers, being so carefully restricted by standards set up in other times, have been considerably depreciated, and equally he ought to have no difficulty in framing proposals to assist in rehabilitating and improving that position. It is not to the interest of the gas consumer that the undertaking supplying him should be starved for capital; on the contrary, his interest lies in business development which produces economies, and thus tends to reduction of prices. Consumers, large and small, also want sound and attractive investments, and if local ones all the better; and Parliament ought to allow—as they have allowed in the case of the war loan—capital issues on such terms as will appeal to, and encourage, the small investor. In this way, benefit would accrue all round from improved capital conditions. If a case on these lines were made out by the administrators of a gas undertaking, showing benefit alike to undertaking, consumers, and shareholders, it would surely appeal to the sympathies of Parliament, in view of the serious times through which we are passing, and the effect that these times will have deep down in the future. While there may be differences of opinion, owing to differences in individual circumstances, among directors of gas companies as to how best to obtain relaxation of the capital conditions of their undertakings, and make the capital more attractive and more diffusible among investors of all capacities, this must be admitted by them all—that, provided a case could be made out for revision, no time was ever more favourable than the present, or is likely to be more favourable, for asking Parliament to give it consideration. In one or two instances this session, Parliament has shown a desire to be helpful in this matter, and next session, with adverse conditions accentuated, the views of Parliament ought to be exceedingly benevolent. The same with local authorities. We do not think gas directors need be at all restrained in applying to Parliament by any consideration of the possible attitude of local authorities, as, under the conditions set forth in this article, Parliament would, we feel, be extremely impatient of any unreasonable objectors.

Under these circumstances, we repeat, with greater emphasis than was employed eight months ago, that there is

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need for the administrators of gas companies to review their capital position, and see whether they cannot carve out of the untoward circumstances created by the war a course which may ultimately redound to the advantage of their undertakings, and especially to that of the consumers. To do this, consideration must be given to the terms in parliamentary enactment which are out of joint with current conditions, and which will inflict a measure of hardship, in comparison with other industries, never contemplated by Parliament when the regulations were applied. Take, for instance, the standard price under the sliding-scale. The standard prices in some Acts of Parliament may have been perfectly reasonable up to (say) July of last year; but then others were not. Anyway, a fair number of standard prices could to-day be found which are not at all compatible with the current and prospective conditions—conditions some of which are permanent (such as the higher price of coal and others materials and stores, the growing competition in coke and sulphate of ammonia, the enhanced price of labour, and increased taxation and rates), conditions some of which will be of long duration due to the war, and the war loan condition which has set up the new standard of capital values. The standard price is a matter which should be reconsidered with the view where necessary to revision.

Another point that Parliament might be invited to look into is the proportion of increased dividend under the sliding-scale. Inasmuch as the investor will expect more for his money in future from gilt-edged securities than he has had in the past, so likewise he will naturally look for an increased share in the profits of enterprise subject to such market risks as gas undertakings must necessarily be. It has often been pointed out to Parliament how small is the proportion of the shareholder compared with that of the consumer of the profits in a sliding-scale undertaking when a reduction takes place in the price of gas. In view of the altered conditions, the investor will for a long time to come, we are afraid, be dissatisfied with this proportion; and unless Parliament acts in this respect with greater generosity towards the shareholder, we shall see a growing disinclination on the part of gas companies to adopt the sliding-scale in the future—a result which would be deplorable in the interests both of the industry and of the consumer. There is also the question as to the revision of the auction clauses, or rather their temporary abandonment, if new issues can be better negotiated without them. Among other new powers which would help the companies to meet the new situation are the following: Power to issue redeemable capital (whether loan, preference, or ordinary), and power to redeem a proportion of existing capital; power to issue loan capital without necessarily issuing any proportion of ordinary capital; an increase of the borrowing power (as was allowed in the Ascot case this session to the extent of one-half the ordinary capital); an increase of the fixed dividend in certain maximum dividend cases with rights of conversion to existing holders. There are some cases, we believe, in which Parliament has fixed the interest on loan and preference capital. These restrictions should all be repealed. In fact, every condition of every kind which clogs the issue of capital should now be removed.

In the same way that Parliament has refused to allow the 4½ per cent. war loan to destroy the value of the 3½ per cent. war loan, so ought gas directors to do what they can to assure that the new conditions—conditions created by the war, and not by the ordinary ebb and flow of circumstances which produce fluctuations of market values—do not unduly depreciate the values of gas companies' stocks and shares, and they ought to do all they can to make them as attractive as possible in view of the new financial situation to which the old standard capital regulations do not apply. The whole matter is one for careful consideration, and a prompt and courageous appeal to Parliament where a company can make out a fair case for the relaxation of its existing statutory conditions, or the enactment of new ameliorative provisions.

Northern Coal Deliveries and Exports Last Winter—A Matter for Inquiry.

Throughout our comments on the coal situation, there has been an endeavour to make it perfectly clear that the matter was being treated from the general point of view, and that, in so dealing with it, there was no intention to imply that coalowners and factors were all in the same boat in respect of contribution to the difficulties and burdens of the country. We are led to repeat this because one of our correspondents —a gentleman whom we respect, and who is largely interested in the coal trade—in the course of a private letter states that the collieries in which he is concerned are "not " finding any difficulty with regard to the working of our " several contracts with British gas-works, or, in fact, with " any gas-works; and I cannot see why there should be so " much difficulty existing as there appears to be, judging " from public comment." We are glad to have this assurance from one in his position; and those gas undertakings with contracts in his hands are to be sincerely congratulated. All the same, the difficulty of which he speaks has been, and is still for some works, an acute and real one. Within our knowledge, there are several gas-works the managers of which have to-day great cause for fear as to the future. By the same post that our correspondent's letter came to hand, the engineer of a not unimportant gas-works wrote to us that, while price was the subject of much anxiety for him, a greater present cause of anxiety was the securing of coal, and seeing it safely in stock on his works. Another engineer, with upon him the technical and commercial responsibility of a large concern, tells us that, soon after the Coal Export Regulation Committee set to work, he became much more hopeful as to stocks; and, during the period that the Committee have been exercising control of the coal sent to neutral countries, his stocks from the North, which well into May amounted to only about 14,000 tons, had risen by 10,000 tons by the third week in June, and to-day the coal is coming in well. These are only examples of information to like effect in our possession; so that our friends in the North who would like us to minimize the difficulties there have been, and the difficulties that in several places there still are, in connection with gas undertakings, and do something to try and moderate the directness of the appeal to Parliament, will see that the gas industry is not without good cause in the attitude taken up in regard to the general question.

But while our colliery correspondent assures us that he has no difficulty with regard to the contracts that he has running with gas-works, he admits, in an earlier part of his letter, that, during the first six months of the war, "great " difficulties" were created. But he casts the blame for this on to "contractors not taking out their quantities, and thus " depleting their stocks." He proceeds: "This has no doubt " caused the greater part of the trouble, and, in addition, has " been a very serious loss to the different coal companies " whose collieries were left standing while the gas companies " were using up their stocks. You will therefore agree that " the difficulties have not been caused by the collieries." We can hardly consent to any such complete endorsement; and a reason will be given presently, and one which ought not to be left without a full and searching inquiry on the part of the Government. Concerning our correspondent's submission as to "contractors" being the cause of the greater part of the trouble and of loss to the collieries by not taking their contract quantities of coal, we should like to ask him whether he really thinks that gas-works would, could they have obtained deliveries of coal, have pursued such an uneconomical course as to work from stock, and deplete stock to the extent that they were compelled to do? They, like certain of the more reputable coal factors, could not get the coal they wanted transferred from the North; and, in consequence, every possible form of pressure was brought to bear not only on collieries (northern and others), shipowners, and railway companies, but upon the Government, with the view to getting them to assist in relieving the position. But things went from bad to worse. Surely these conditions are not altogether unknown to our correspondent.

Beyond these conditions, after the drop in coal exports at the beginning of the war, month by month, the exports from the North increased. This is shown by the monthly returns of the Board of Trade; and, moreover, it has been pointed out in the House more than once that supplies of coal from the North to certain of the neutral countries were greater than in the corresponding months of the preceding year. At the time when many home gas-works were face to face with a most perilous position, captains of their boats had the mortification of seeing shipload after shipload of coal sailing away under the flags of neutral countries, while they were waiting for supplies for home use. Had the embargo on coal exports to neutral countries taken place quite early in the year—say, about Jan. 1—there would have been much more coal available for the United Kingdom and our Allies; and gas-works would have been not only willing but eager to replenish their terribly reduced stocks. Any colliery owner who would try now to throw the blame upon gas-works for the difficulties that arose some months ago, and for those that have issued from them, would find it hard to explain, in conjunction with the accusation, how it is that, following the coal export prohibition, with less men working in the mines than in the war months of last year, the stocks of the London and other gas undertakings supplied by water have largely increased. One result of this greatly improved supply is that carburetted water-gas makes are being diminished, and a larger quantity of coke is being produced for the market.

There is yet another matter. Had the coal export prohibition taken place earlier, the very boats that were carrying coal to neutral countries would have entered into competition for the home conveyance of coal, and so would have brought about a reduction of the rates of freight, as they have done since the Exports Committee have been at work, with the result that freights have receded to 7s., compared with (say) 17s. at the beginning of the year. If 7s.—nearly twice as much as the rate before the war—had ruled throughout, the collier owners would have reaped a handsome profit, and things would have been altogether different. It is, indeed, just possible that the release of boats running to neutral countries would, with the interned boats, have kept the rates for freights from the Tyne to London much nearer normal than even the 7s. Supplies of coal, too, with earlier export prohibition, would have been plentiful from the North; and the price of gas to the consumers would not have had to be raised to the extent that was the case through the conditions which then prevailed, and which conditions were the means that enabled the contract prices of coal to be raised to the present levels, and which prices will now prevent an immediate return to lower charges to the gas consumers. These are facts that cannot be dismissed by general statements, or by any confession of ignorance as to the state of things that brought the stocks of British gas-works down to such low and alarming levels at the greatest height of their winter need.

Under the circumstances, in our opinion, and in that of other people, there ought to be very strict Government inquiry in order to ascertain why it was there was an increasing amount of coal passing from this country to certain neutral countries during last winter when all home industries were crying-out for supplies, and as to the ultimate destination of a large part of the coal. It was admitted by Government representatives at the time the Export Regulations Committee were appointed that fears existed that some of the coal exported from this country was destined for enemy countries; and the little public protest that there has been (whatever there may have been privately or indirectly) from the colliery owners against the restriction placed on exports to neutral countries, gives colour to the idea that the colliery owners must have known that, though they were not directly trading with the enemy, all the coal that was passing to neutral countries was not required for the current needs of those countries—at any rate, there is no evidence that colliery owners tried to satisfy themselves on the point. Can any reasoning individual doubt the ultimate destination of much of this coal? There is ground for fear that what Sir Charles W. Macara, the late Chairman of the Federation of Master Cotton Spinners' Association, has said with reference to cotton applies with equal force to coal—any way up to the middle of May. He writes:

> I am afraid the British Government does not yet fully appreciate the importance of preventing cotton, which is the main factor in producing high explosives, from reaching enemy countries from any part of the world. Large quantities of cotton have filtered through neutral countries to both Germany and Austria. . . . Until a few months ago aëroplane cloth, which is so largely made in Lancashire, was undoubtedly getting to enemy countries through neutral countries; and it is a question if this is entirely stopped to-day.

The captains of British colliers were strongly of opinion that a large amount of the coal which was being loaded into neutral ships at North-East coast ports was, well into May, passing over the German borders. Colliers flying the British flag were somewhat rare. It is indeed hard to understand why Holland, with an army half (or more) mobilized, should be receiving coal carried by about five times the number of colliers flying the Dutch flag that it had in times of peace, and why Scandinavia and Denmark, with their armies partially mobilized, should to-day be receiving coal by about three times the number of colliers flying the flags of Norway, Sweden, and Denmark than were running in normal times. If, as is the opinion of captains of British colliers, a large proportion of this coal was finding its way into German hands, then (may be in an indirect way) it was being converted into ammunition for use against our own forces and those of our Allies—at all events, it was benefiting a country at war with us. It should be an easy matter now to gather information from the captains of colliers as to what was going on; and it should not be difficult, through the agencies at the command of the Government, to trace out those who were engaging in this trade. The Board of Trade—the appointment of the Coal Exports Regulation Committee proves it—had their suspicions aroused. But the Board were apparently slow, or too busy, to grasp the truth of a matter that was brought to their notice in January until they made the move which began to have good effect about the middle of May.

We repeat that this is a matter into which there ought to be a very thorough inquiry by the Government—not only because these exports partly account for the high prices that have been charged to many gas among other enterprises, and meant the removal of coal from this country when there was a shortage here, but because the question is one touching national interests in the most critical period of our country's history. Those interested in collieries must really not think that there is only one source of information about coal matters, and that source themselves. If they nurse such a belief, they are simply deceiving themselves.

Early Gas-Fire Installation this Year.

To talk of gas-fires in the early days of summer is seemingly to show a disregard of the fitness of subject to time. But it is not so this year; for if ever there was a time in which we should "take thought" and look well ahead not only in the matter of supplies of coal and other materials but of gas-consuming goods for stock and early installation, it is now. We cannot tell what next winter will bring forth, when the full effects of the depletion of labour will be felt in all lines and branches of industrial and transport work.

In the gas industry, we have adopted as an ideal in domestic heating, "a gas-fire in every room of every house." Such an ideal is the *Ultima Thule* of this particular matter; and we are fully conscious that it is an ideal that will be long before it is reached. But in any walk or business of life, it is well to have an ideal to attain which will require constant and protracted perseverance; for every step made towards it gives additional encouragement and incentive, and so greater accomplishment is realized. In recent years, gas-fires have gone ahead in adoption for household purposes at a remarkable rate; and, as a result, the ideal which has appeared so unattainable has had some of its cloaking of impossibility torn off. This being so, we must not allow the war to undo or even depreciate the valuable work achieved in connection with domestic gas heating during the years immediately preceding the war, but must still persevere so that there is continuity in the work. An interruption in developing efforts at the present time would surely mean that much of the influence of what has already been done would be largely destroyed; and it would in the result be necessary to restart after the war a long way back on the road of which a good distance has previously been traversed. This would never do. The gas industry has to contend with very powerful interests in this matter of supplanting, by scientific means of heating, air-polluting solid fuel; and it must not neglect the electricity supply industry with its so-called electric "fires," which are to depose the old lamp form of electric-radiators.

As was seen in the "Point-Five" paper referred to in "Electricity Supply Memoranda" last week, assent is now given by electrical engineers to what we have long known to be, and what experienced readers knew was, a fact—that the old form of electric radiator was very uneconomical and inefficient as a heating agent, and that the occupants of a decent sized room fitted with such a radiator (forgive the misuse of the term) could not enjoy any warmth from it, except by sitting one at a time in the path of the radiations from the lamps, and then the person so sitting could only enjoy the sensation of warmth on the side of his or her structure that was exposed to the radiations. One of the four-lamp radiators of the old type required a unit of electricity per hour. That type has had its day; and a new form—with incandescent bars—is now being recommended, although absorbing some 3 or 4 units per hour. The electrical industry has learned the lesson that a sufficiency of heat cannot be given without there is a sufficient expenditure of energy.

Such expenditure, however, with electric-fires means a heavy running bill; and the higher working temperature results in more rapid destruction and greater maintenance costs for a fire which is expensive initially. Nevertheless the new fire offers to the electricity industry the only hope of retaining a little heating connection; but it will still be "little" owing to uneconomy. However, the electrical industry is going to push these fires as much as it can. But fortunately the gas industry has more efficient means—efficient both as heating and ventilating agents, and cheaper in first cost, and lower in maintenance and running costs.

With such merits on the side of the gas-fire, there is no fear of competition; but it is necessary that this year an early start should be made in urging consumers to send in their orders for gas-fires, and have them installed now and onwards before actually being required for active service. The work of fitting gas-fires must be commenced betimes this summer. The cry of many gas managers during recent winters has been for a larger number of efficient fitters; and the great thing this year will be to make the utmost possible of the fitters who are now available for the work by spreading the fixing of gas-fires over as long a period as can be arranged in collaboration with householders. To bring this about, householders should at once be the recipients of circular letters, pointing out the advantages to them of placing their gas-fire orders in good time. Doing so, they should be informed, will ensure them getting the installation work done in view of the scarcity of fitters, owing to the thinning-out of the ranks by the claims of the country; and they will be also assisting in lightening work made heavier by the war. Furthermore, the early provision of gas-fires will be a prudent preparation for a winter in which coal is likely to be costly and scarcer than it was last winter. They might also be reminded that for the coming winter large coal provision has been made by the local gas undertaking, and that gas for heating will therefore always be "on tap."

Coal Deliveries under Old Contracts.

Up to the time of writing, Mr. Runciman has not been in a position to make an announcement as to what the Government propose to do as to the regulation of coal prices; but the past week saw the official smoothing-out of the difficulties in South Wales between the miners and the owners, through the intervention of the Board of Trade. Unfortunately, however, there was large discontent among the miners over the settlement; and, at the end of the week, a number of pits were idle. In connection with the question of Government regulation of coal prices, the gas industry is being singled-out by the coal owners for special attack. Sir Joseph Walton, M.P., is a good example of an attacker; and his words instance the false notions entertained as to current coal supplies to the gas industry. He recently told the Parliamentary Coal Supplies Committee that gas undertakings were still receiving coal under their old contracts at low prices; and the colliery owners were supplying this coal at a loss, though the gas industry was receiving high prices for coke, and colossal prices from the Government for such products as toluol. This is a one-sided tale; and its omissions, as every gas man knows, make it very untrue.

Causes and Effects.

That coal is still being delivered under old contracts is due to various causes—viz., the large quantities of coal exported last winter (part of which ought to have been retained to fulfil home contracts), the large quantity of coal which found its way into the open market instead of to the works of contractors, and the trouble there was last winter with both railway and ship conveyance. Gas undertakings are not really making anything out of the position by having deliveries now under the contract prices of 1914-15. As a matter of fact, when coal proprietors were selling dearly in the open market not so very long since, the gas undertakings had to buy (as Sir Joseph Bellamy explained at the Plymouth and Stonehouse Gas Company's meeting the other day, as reported in this issue) at the price asked, wherever coal could be obtained, in order to keep their works going. It was not a question for their decision as to the price to be paid. They had to pay what was demanded; and some one interested in coal pocketed the unreasonable profits. This condition is a set-off against now receiving coal under old contracts. Then as to the price of coke, it is higher; but a couple of tons of coal have to be handled and carbonized before a ton of coke is obtained for sale. As to the "colossal" figures being paid for toluol, this is an exaggeration. The small percentage paid by the Government on working costs is anything but "colossal." Gas undertakings, despite all Sir Joseph Walton drew from his imagination as to their position, have not been able to make both ends meet without increasing the price of gas; and shareholders in gas companies have, in consequence, suffered a heavy fall in the rates of their dividends. Low gas-priced companies like Sheffield, Plymouth, and Wandsworth have had to advance their charges to gas consumers owing to the price of coal; and we should not be astonished to receive intelligence at any time now that Widnes has followed suit.

Direct Recovery in Gas-Works.

Reading the reports of the District Inspectors under the Alkali Works Regulation Act [extracts from which are given elsewhere], one cannot fail to be struck by the several references to the adoption of the direct sulphate of ammonia process for ordinary gas-works purposes. It is clear that good progress is being made in this direction. In the report dealing with the South Midland and Norfolk district, it is stated that five such plants are in operation in the area. They appear to give every satisfaction; and the salt produced is of good colour. In the South and South-West of England, of four reconstructions of plant two are on the direct method, and five new registrations are all on this system. In the North of England report, it is stated that the direct system continues to give satisfaction at the one gas-works where in use. In Scotland, little progress has as yet been made with the direct process in gas-works; but Ireland boasts of one such plant. The facts given above indicate that a sturdy commencement has been made with the introduction of the direct sulphate of ammonia system into gas-works; and it is pretty safe now to prognosticate a large future for it.

The Nitrate Half Year.

A few generalities and figures which can do no harm are admitted by Messrs. W. Montgomery and Co. to form the constituent parts of their report on the nitrate of soda market during the past six months. The reason for this is two-fold—the impossibility of obtaining correct information as to deliveries and stocks on the Continent, and the wish not to publish anything which might be of the slightest value to the enemy. It is remarked that at the commencement of the year an impression prevailed that nitrate for this country would be in superabundance during the spring. In the event, however, while there was a sufficiency, there was at no period too much. A great deal of it was transhipped to Russia, and some to France and Holland. But, in spite of the numerous difficulties which had to be surmounted, the firm express the opinion that, though it is hardly possible to give reliable data as to consumption in the United Kingdom for agricultural purposes during the past six months, it has not decreased. Naturally, for use for explosive purposes, there has been a considerably increased demand. Prices throughout the season have had a continuous advance. Nitrate which in January was obtainable at 5s. 9d. per quintal f.o.b. Chili, prompt shipment, now commands 6s. 10½d., with about 2d. per quintal more for forward shipment. Monthly parcels over 1916 have, it is stated, been sold in considerable quantities at 7s. per quintal, with sellers holding for rather more money. The production for the past six months [estimating the June output], shows a decrease, when compared with the same period of 1914, of no less than 62 per cent. In the same time, the shipments to Europe have amounted to about 355,000 tons, against 832,000 tons last year, or a decrease of 477,000 tons. As to the future, the firm point out that, even after the termination of the war, there must necessarily for a time be much employment for tonnage, while there is also the probability that a freer market for nitrate might bring about an advance in the article itself in Chili. Should hostilities continue six or eight months longer, they conclude, then it is very doubtful whether nitrate will be cheaper for next spring delivery than it is to-day; and it might easily be dearer.

Economy and National Finance.

In these critical times, when colossal liabilities are being built up, we are asked to place ourselves under rigorous control and restraint. If not of military age, we are requested to enrol for munitions work. All the units of our population between the ages of 15 and 65 years, irrespective of sex, are now to compulsorily register, in order that an assessment may be made of what the nation is capable of doing. The Premier, too, has started a big campaign, for promoting national economy, in order to make thrift the source for the provision of a large part of the war loan. This is all good and necessary; but it must not be carried beyond the borders of sanity. Carried too far, we should suffer nationally, and undermine the real resources of the country. While we are organizing for the war, of course everything else must be subordinated to the main object, so long as the main object is not detrimentally affected by the subordination. Industry and commerce are the bed-rock of our material and financial power; and it would be folly indeed, in the cause of the main object, to disorganize industry to such an extent as to deprive it of the vital power to its sufficient maintenance; for from it the "sinews of war" have to be produced. Such disorganization would be the worst possible thing in the interests of the country. The realization of the desire of industrial men to serve, in one way or another, in the great struggle, and the special financial regulation that there is to-day in some directions, must have their limits, or there will be a grave necessity shortly to start reorganizing things at home, in order to prevent a collapse, through overlapping, of some of the very sources of the nation's strength. Luxury and waste have been indicted. This is right; requirements must be restricted to necessaries. But what is called "economy" could be pursued to such a length as to altogether upset the national economic situation. Mr. Asquith says expenditure must be diminished, and savings increased. If more can be saved, more can be lent to the State.

The Money-Producing Sources.

But the financial needs of the State are, through the war, four and more times greater than in normal times, and these needs will be continuous for some time to come. Whence is this continuous flow of money to come if we are to fight to a victorious end? The Premier answers, "If you spend less, you either reduce the cost of imports, or you leave a larger volume of commodities available for export." The argument is sound; but it has its bounds. It is sound so far as it means less indebtedness to other countries, a larger business with and income from other countries, and relieves pressure at home occasioned by the scarcity of certain commodities. But if a too stringent economy, through the reduction of home consumption and use, injures important profit-producing national industries, we cannot help thinking that the country itself will be harmed and its financial strength weakened. Gas is an economy-producing agent, through the reduction of labour that it effects in the household. It produces economy, too, when used for heating in lieu of coal by preventing the destruction of valuable commodities. If people carried economy to excess in connection with the use of gas, the profit producing and circulating power of the industry would be depreciated, and so would be the power to financially help the nation. The ability of the industry to produce raw materials for other industries would be reduced; and so would be the power of the industry in relation to the yield of ingredients for the making of ammunition. Economy is correct; but only so long as it contributes to the financial strength of the country. When it affects its money-creative power, then it is not right, and more particularly at a time when the drafts upon the money-producing resources of the country are of unprecedented magnitude.

War Badges for Workers.

Touching the discussion which took place on this matter at the last meeting of the Institution of Gas Engineers, and the refusal of the War Office to give official authorization to such a badge for gas workers [see Mr. Dunn's letter in the "JOURNAL" for June 15], it is interesting to note that, during the Committee stage of the Munitions Bill, a new clause was inserted enabling the Minister of Munitions to make rules authorizing the wearing of badges or other distinctive marks by persons engaged on munitions work or other work for war purposes, and to prohibit the use of unauthorized badges. The last few words rather knock on the head the use of a distinctive badge by gas workers, unless Mr. Lloyd George gives due authorization to them. Perhaps, however, in view of the valuable contribution that gas-works are making to the provision of materials for the production of high explosives, and the part they are taking in the provision of light, heat, and power for factories engaged in the turning out of munitions, Mr. Lloyd George may open his heart, and allow unsparable skilled gas workers to come within employment upon "other work for war purposes, and so enable them to wear badges."

PERSONAL.

MR. DOIG GIBB'S RETIREMENT.

IN connection with the retirement of Mr. W. DOIG GIBB from the position of Chief Engineer of the South Metropolitan Gas Company, the workmen members of the Co-Partnership Committee recently assembled in the Livesey Institute in the Old Kent Road, to present him with a handsome illuminated address, subscribed for by the workmen of all stations and depôts.

Mr. W. Beard voiced the universal regret felt at the news of the retirement of Mr. Gibb, who, he said, had gained the esteem and regard of every workman in the service of the Company. They all looked upon him as a friend; and every workman at every station had contributed to the cost of the address, which they presented as an evidence of their good feeling. Other speakers having borne testimony to the cordiality of the feeling of all ranks towards Mr. Gibb, the address was read by Mr. Beard and formally presented.

In acknowledgment, Mr. Gibb mentioned that his retirement was occasioned by his being completely run-down. It was one of the proudest moments in his life when he was told that he had won the regard of the workmen as well as the staff; and he was grateful indeed for this tangible token of their goodwill. He was as sorry to part with the men as they were to lose him. His relations with them had always been pleasant, and he had found South Metropolitan co-partners to be a sensible and reasonable set of men. He felt that in leaving them he was parting with real friends.

The proceedings closed with the singing of "For He's a Jolly Good Fellow," and hearty cheers for Mr. and Mrs. Gibb.

It is understood by the "Co-Partnership Journal of the South Metropolitan Gas Company" that the testimonial raised by the staff officers has taken the form of a silver rose-bowl and candelabra, and that, in deference to the state of Mr. Gibb's health, it has been arranged for the presentation to be private.

Mr. CHARLES C. SEYMOUR has been appointed Assistant Manager of the Weston-super-Mare Gaslight Company.

Mr. JOSEPH WILLIAMSON has resigned the post of Gas Manager to the Arlecdon and Frizington Urban District Council.

Mr. H. B. KNOWLES has been appointed Assistant-Manager at the Darwen Corporation Gas-Works, in the absence of Mr. ALAN BERRY, who has joined the Mechanical Transport of the Army Service Corps.

Mr. SAMUEL MOORE, Manager of the Dromore (co. Down) Gas-Works, has been appointed Manager of the Portrush Gas Company, in place of Mr. J. W. M'Lusky, who was recently put in the charge of the Airdrie Gas-Works.

Company Sergeant-Major FREDERICK BARTER, of the Special Reserve, attached to the 1st Battalion of the Royal Welsh Fusiliers, who is an employee of the Cardiff Gas Company, has been awarded the Victoria Cross for most conspicuous bravery and marked ability at Festubert on May 16. When in the first line of German trenches, he called for volunteers to enable him to extend the British line; and, with the eight men who responded, he attacked the German position with bombs, capturing three German officers and 102 men, and 500 yards of their trenches.

At their meeting a week ago, the Biddulph Urban District Council had before them a letter from Mr. H. SIMCOCK tendering his resignation as Manager of the gas-works, unless the Council were prepared to accede to his demand for an increase of his salary to £104 per year. The matter had been referred to the Council by the Gas Committee, and was discussed by them in private. The announcement was subsequently made that Mr. Simcock's resignation had been accepted, to take effect from the meeting; and that he would be paid a month's salary.

Mr. G. GERARD WILSON, elder son of Mr. John Wilson, of Hagley Road, Edgbaston, has been granted a commission in the 3/8th Warwickshire Regiment. Born in 1892, Mr. Wilson was educated at Edgbaston Preparatory School and King Edward's High School, New Street, and showed promise as a good all-round athlete. In 1912, he won the Silver Medal (highest award) in the Final Examination in "Gas Engineering," and until September last was an Assistant-Engineer at the Saltley Gas-Works of the Birmingham Corporation. He then joined the 1st Birmingham Battalion, and has since been in training at Sutton Coldfield.

Mr. J. C. WRIGHT, late of West Ham, has been appointed Assistant-Manager to the Grays and Tilbury Gas Company, in consequence of Mr. J. H. Hornby's absence at the front. Mr. Wright received his training under his father (who was Engineer of the Bromley works of the Gas Light and Coke Company), previous to entering the service of the West Ham Gas Company. At West Ham, he was for two years Assistant-Engineer to Mr. E. H. Thorman, four years to Mr. J. Thorman, and thirteen years to Mr. John Clark, upon whose death Mr. Wright was appointed Acting Engineer until the amalgamation. During his time there, the works were re-modelled, and considerable extensions undertaken; and the make of gas increased from 603 to 2007 million cubic feet, in spite of the competition of three Corporations supplying electricity in the Company's district. The Grays and Tilbury works are thoroughly up-to-date, with vertical retorts, water-gas plant, &c. There is a run of about 21 miles of high-pressure main, from which the surrounding rural districts are supplied.

It will be seen from the news columns of this issue that on the retirement, after 46 years' service, of Mr. William Ford from the management of the Stockton-on-Tees Corporation Gas-Works, Mr. Matt. Dunn, who for over twelve years has been Assistant-Manager, has been appointed to succeed him—Mr. Ford, at the same time, being made Consulting Engineer. Mr. Dunn, who has for years taken an active interest in gas matters generally, and has been a keen lecturer on these and allied subjects, is a Past-President of the North of England Gas Managers' Association, a past member of the Council of the Institution of Gas Engineers, and a member of the Institution of Mechanical Engineers; and besides many certificates and prizes in engineering, drawing, steam, and mechanics, he holds an honours diploma in gas manufacture, supply, and distribution. After having been articled to Messrs. Ashmore, Benson, Pease, and Co., he was appointed, in 1893, Manager of the Selby Gas and Water Works, and carried out there extensive alterations and additions. Five years later, Mr. Dunn took up a similar position at Goole, where he also was responsible for a great deal of work. His next move was in 1902, when he went to Stockton, and has since remained there.

The position of Gas Manager at Droitwich (rendered vacant by the removal of Mr. F. Shewring to Tawe Valley) has been filled, from among eighty odd applications, by the appointment of Mr. Reginald Thomas, the Secretary and Manager to the Minehead Gas Company, Limited; and he will take up his new duties the beginning of next month. Mr. Thomas was first employed for seven years, under his father, at the Wellington (Somerset) Gas-Works, where he acted as office and works assistant. On leaving Wellington, he went to Woking, serving there for three years under Mr. W. H. Ely, during which time the works were practically remodelled, and large extensions of mains took place. Mr. Thomas has been at Minehead for nearly six years; and the make has increased from 17 to 26 million cubic feet per annum. Many additions to the plant have been made, including a retort-bench, washers, scrubbers, purifiers, and a boosting plant—the last named to cope with the "season" demand, which is becoming very great. Appliances at the rate of 200 a year have been fixed; and a large number of water-heaters have been installed, mainly due to the opening of new offices and show-rooms in the centre of the town. The capital has been increased from £9000 to £15,000, and the dividends from 7 to nearly 9 per cent., in spite of keen competition. The Electricity Company have twice been challenged by Mr. Thomas to substantiate their claim that electricity is cheaper than gas for cooking; but on both occasions they failed to take up the challenge. Mr. Thomas holds an honours certificate in "Gas Manufacture and Supply."

OBITUARY.

The death is announced, at Wilmslow, in his fifty-ninth year, of Mr. Harold Nickson, the head of a large firm of coal dealers in the Manchester district. He was a son of Mr. Charles Nickson, formerly Superintendent of the Manchester Corporation Gas Department, who survives him. The late Mr. Nickson was a Founder and the first Master of the Lord Stanley Lodge of Freemasons. His death, which followed upon an apoplectic seizure, is deplored by a wide circle of friends.

It is announced in the "Journal für Gasbeleuchtung" of the 19th ult. that the death occurred on June 7, from an apoplectic seizure, of Herr Karl Pfudel, the Manager of the Charlottenburg Corporation Gas-Works. Deceased, who was in his sixty-seventh year, had fought as a volunteer in the Franco-German war of 1870-71. He had been an active member of the German Association of Gas and Water Engineers, and an especially active supporter of the affiliated Brandenburg District Association.

The "Zeitschrift" of the Association of Gas and Water Engineers of Austria and Hungary of the 15th ult. reported that M. Isidor Bernauer, the Manager of the Budapest Corporation Gas Undertaking [a first instalment of whose description of the new Budapest Gas-Works will be found on a later page of to-day's "Journal"], has lost his son, M. Marcell Bernauer, a Lieutenant in the Reserve, from wounds received in battle at Lisowice in Galicia, on May 19. Lieut. Bernauer, who was an engineering assistant at the Royal Josephs' Polytechnic at Budapest, had earlier been decorated for bravery in the field.

The death has occurred from enteric, at the Alexandria Hospital, of Mr. H. P. Adcock, who was attached to the Divisional Engineers of the Royal Navy serving in the Dardanelles. Mr. Adcock (who was Junior Assistant and Chemist to Mr. F. W. Cross, the Engineer and General Manager of the Lea Bridge District Gas Company) served his articles with Mr. A. E. Broadberry, at Tottenham, and joined the Lea Bridge Company in 1912. He was a student of the Institution of Civil Engineers, and just previous to leaving for the Dardanelles obtained a few days' leave, which he spent in sitting for his examination for associate membership of the Civils; and at the same time he got married. His death is deeply regretted by all who knew him.

GAS COOKING AT INDIAN HOSPITALS.

A batch of interesting photographs—one of which is reproduced to-day—has been forwarded by Mr. Philip G. G. Moon, the Acting General-Manager of the Bournemouth Gas and Water Company, showing some of the gas cooking apparatus at the Indian hospitals at Barton-on-Sea and Milford. These hospitals accommodate about 1200 Indians; and all the cooking is done by gas. There are fixed 740 ring-burners, 20 large double cookers, and 16 gas-heated boilers. The gas for the supply of the hospitals is produced at the Bournemouth Company's Poole works, some 20 miles away from where it is consumed.

A KITCHEN OF RING-BURNERS AT THE MARINE HOTEL, BARTON-ON-SEA.

GAS LIGHTING AT THE PANAMA-PACIFIC EXPOSITION.

For the two exceptionally good night photographs of high-pressure gas lighting at the Panama-Pacific Exposition reproduced here, we are indebted to Mr. George G. Ramsdell, the Secretary of the American Gas Institute, who received them from Mr. E. C. Jones, of San Francisco, the President. An idea of the nature of the lighting will be gathered from these pictures. Those responsible for the arrangements feel justified in claiming that there has never been a more instructive display of the usefulness of gas for lighting purposes than is now in constant operation at the exposition. In addition to this, gas is also being used in all parts of the grounds for culinary and other fuel purposes.

One of the photographs shows the Netherlands building looking west on the esplanade, with the Massachusetts building, which is a reproduction of the State House, in the distance. On both sides of the esplanade are rows of high-pressure gas-lamps, giving a mean lower hemispherical candle power of 1160 candles each. This picture was taken during a reception given in honour of the Governor of New York, and shows a number of automobiles parked. The first limousine is so brilliantly lighted by the gas-lamp immediately over it that the interior fittings of the car are easily discernible.

The second photograph is a view of the west end of the Palace of Fine Arts, looking toward the French Pavilion. This place is entirely lighted by gas; and there will be noticed the remarkable flood lighting of the building and the statuary in the foreground.

Purification of Producer Gas.—Writing in a recent issue of "The Iron Age," Mr. A. J. Wallace dealt with the removal of sulphur from producer gas. The author pointed out that gas purification from the standpoint of the steel trade involves the question of whether the sulphuretted hydrogen can be removed from producer gas at a low cost. This he answered in the affirmative, and stated that at gas-works sulphur purification is the lowest cost on the list—ranging from 0·0005d. to 0·001d. per 1000 cubic feet, depending upon the sulphur content, methods employed, &c. The material is used in the form of iron sponge, representing a mixture of the oxide with shavings, coke breeze, or anything of like character. Until recent years, the usual installation consisted of four cast-iron boxes, rectangular in form, and varying from 3 to 6 feet in depth. Modern practice has, however, veered towards exposed steel cylindrical purifiers, which can be erected at a much lower cost. The modern type of purifier is 10 or 12 feet in depth, and carries two and sometimes three layers, as compared with one, or two at the outside, in the older boxes.

THE EXAMINATIONS IN "GAS ENGINEERING" AND "GAS SUPPLY."

List of Successful Candidates.

The pass-lists for the last City and Guilds of London Institute examinations in "Gas Engineering" and "Gas Supply" have been sent to the Institution of Gas Engineers; and they have been forwarded to us by Mr. Walter T. Dunn, the Secretary, for publication. The questions set by the Examiner in the first-named subject—Mr. Samuel Glover, of St. Helens—were given in the "Journal" for April 27, p. 217; and those put by Mr. Walter Hole, of Leeds, on "Gas Supply," will be found in the succeeding issue. The names of the prize winners will probably be announced in the course of a few weeks.

GAS ENGINEERING.

FINAL GRADE.

First Class.

Berry, Richard
Booth, James H.
Burr, James
Butterfield, John A.
Claridge, Wilfred B.
Cornish, James H.
Fairclough, Herbert
Hoskins, William A.
McQuillan, Arthur J.
Mills, Albert H.
Muddiman, Ernest W.
Noble, John H.
Norman, Colin
Payman, William
Postlethwaite, Wm. H.
Probert, Edward H.
Riddell, Keith O.
Roos, Alfred
Rust, Joseph F.
Sugden, Wallace
Thomas, Leonard H.
Townend, Frank S.
Turnbull, William
Ward, Cyril G.
Weeks, Rodney C.
Wilson, John

FINAL GRADE.

Second Class.

Arthur, Edward
Banford, Frank E.
Barnett, Walter A.
Battersby, Walter
Connolly, Albert W.
Davidson, Alexander N.
Dean, Harry W.
Duncan, Clifford
Elsby, Ralph W.
Eve, Edgar W.
Gandon, Kenneth C. R.
Garrett, George S.
Haynes, John T.
Kaye, Elliott
Prentis, Arthur E.
Poulson, Joseph
Reed, William H.
Sharpe, William
Tonge, Edward C.
Wilson, Alfred C.

GRADE I.

First Class.

Adams, Leslie
Allan, Oswald
Beddow, Clarence
Black, Thomas
Brown, Hubert H.
Clarke, Claude H.
Cooper, James F.
Ekins, Harold E.
Evans, Joseph L.
Ewing, William
Foster, Sidney
Hargreaves, Harry
Harris, Arthur
Hefferman, John
Hepworth, Joseph A. L.
Hickson, Charles E.
Higgs, John N.
Hunter, Frederick S.
Ingham, Charles R.
Jones, Edgar
Keene, Hugh
Knowles, Hubert B.
Lee, Frederick C.
Macnaughton, William
Mooney, Frederick F.
Newby, Charles H.
Ogden, George
Palmer, Charles W.
Plagerson, Reuben
Rearden, Patrick J.
Ridout, Percy B.
Robinson, Cecil J.
Shepherd, Harry
Sparkes, Joseph
Vickers, Ernest
Wills, Albert J.
Wise, William H.
Wood, George W.

GRADE I.

Second Class.

Appleyard, Norman G.
Bainbridge, Edwin
Banyard, Alfred
Barstow, Stanley
Battersby, Thomas C.
Berry, Samuel N.
Butcher, Thomas
Carter, Walter J.
Charlesworth, John W.
Charnley, William C.
Cronk, Leonard A.
Deane, Cedric
Dodd, Allan P.
Easton, Frank
Frost, William H.
Gardner, Joseph
Gerrard, Joseph D.
Hopkins, Frank J.
Hyde, John
McLauchlan, William
Mason, Thomas
Mercer, Arthur
Moss, John
Ogden, Samuel
Parkin, Lawrence
Parrish, John
Preston, John F.
Rooney, Patrick J.
Rowarth, Maurice J.
Speedy, Alan
Stainforth, Fred.
Stanley, Wilfrid E.
Stanton, Leonard V.
Thomas, Harold R.
Tubb, Joseph
Wadsworth, Harry
Walsh, Patrick J. J.
Winters, Harry
Young, William

GAS SUPPLY.

FINAL GRADE.

First Class.

Abbott, Allan
Bailey, Edward
Bellingham, Arthur D.
Booth, James H.
Caesar, Augustus G.
Canlett, Frederick R.
Champion, Alexander J.
Davidson, Alexander N.
Gladstone, William E.
Gregson, James
Griffiths, Thomas
Harris, Thomas W.
Haynes, John T.
Hems, Harold R.
House, George
Howe, John S.
Humphries, Arthur W.
Isaacks, George E.
Jones, Hugh
Lathrope, Frank H.
Longstreeth, Percy D.
Mann, William C.
Manning, Albert H.
Mills, Albert H.
Morton, Douglas
Muddiman, Ernest W.
Oliver, George
Owen, Thomas L.
Perry, Thomas
Price, Howard W.
Roberts, Arthur
Rudge, John
Shore, Charles L.
Tilston, Joseph H.
Thomas, Leonard H.
Townend, Frank S.
Westbrook, William J.
Williams, John
Wilson, John
Wolfe, Thomas A.
Wood, Frederick W.
Young, Donald

FINAL GRADE.

Second Class.

Ashwood, Francis W.
Bateman, Frank
Bewsher, Bryan
Broadfield, Frederick E.
Church, Ernest H.
Christie, Frederick G.
Cottle, Ernest A.
Cotton, Ernest J.
Crane, Charles
Davison, Henry H.
Dicker-Jones, Thomas
Duxbury, James B.
Felby, George
Fotherby, Robert C.
Gardner, William A.
Haley, Henry
Hector, Albert
Hester, James D.
Higgs, John N.
Holmes, George
Hopkins, Frank J.
Hood, John
Jackson, Thomas
Jenkins, Ifer G.
Kenshale, William T.
Lambert, Thomas
Lamond, Alexander W.
Leary, Peter H.
Manwaring, Percy
Newby, Edgar J.
Norman, Colin C.
Park, Harold G.
Parry, George J.
Pennell, Harry G.
Pennington, Jesse F.
Phelps, Leslie J.
Poulson, Joseph
Snowdon, Thomas M.
Squires, Ernest H.
Stooke, Sidney R.
Stopp, George
Tansley, William H.
Taylor, George
Taylor, Walter
Vickers, Charles E.
Vigor, John G.
Wardle, Thomas J.
West, George W.
Westworth, James K.
Wright, Charles T.
Yates, William M.

GRADE I.

First Class.

Amor, Ferdinand J. C.
Anderson, Ivan
Andrews, Hubert A.
Barlow, Alfred
Bates, Walter
Battersby, Thomas C.
Belton, Francis W. J.
Bishop, William E.
Blake, George W.
Brice, Clement C.
Bolton, Wilfred
Booth, John A.
Butcher, Thomas
Caesar, John E. V.
Carr, John T.
Carter, Walter J.
Chaston, Robert S.
Churn, Albert E.
Cole, Herbert K.
Collingbourne, John H.
Coppack, John
Creak, Henry P.
Deane, Cedric
Digby, Walter C.
Duffield, Oliver
Eabry, Richard G.
Evans, David W.
Evans, John R.
Eves, Eric B.
Ewing, William
Feltwell, Frederick H.
Foster, Edmund M.
Foster, Sidney
Gerrard, Joseph D.
Glanville, Percy J.
Glass, Henry F.
Gosling, Gerald
Hancock, William
Harris, William J.
Harvey, Claude
Heath, John
Helyar, Ernest
Henton, Albert E.
Holt, Harold D.
Hunt, Archibald A.
Hunter, Frederick S.
Hyde, Joseph P.
Jack, Han
Jones, Edward R.
Jones, Elias J.
Jones, Samuel W.
Kenner, John A.
Knowles, Hubert B.
Lamb, John C.
Macnaughton, William
Mason, Thomas
Mercer, Arthur
Morgan, Leslie G.
Moult, George E. W.
Moult, Harry
Murray, Stephen
Nelson, William
Nicholson, Ernest
Osland, Herbert J.
Parker, Alfred J.
Parry, William I.
Perridge, Christopher F.
Phelps, Gilbert C.
Pickett, Edgar
Platt, Arthur H.
Robinson, Cecil J.
Rutherford, Henry
Sadler, Francis
Shuttleworth, Arthur
Simpson, John
Skuse, Edward J.
Smith, Frederick
Soper, John H.
Spencer, Ernest
Spurgeon, Charles E.
Sugden, Wallace
Thomas, Arthur J. O.
Thomas, Harold R.
Thompson, Henry
Tilley, William T.
Turner, John A.
Turner, Samuel J.
Turner, William
Udall, Frederick A.
Walter, Leonard
Watts, Albert C.
Weeks, Rodney C.
Westwick, Frank W.
Wiseman, William J.
Wise, William H.
Wyver, Harry

GRADE I.

Second Class.

Ainge, Frederick C.
Appleyard, Norman
Ashwood, Roland S.
Bartlett, Thomas
Beddow, Clarence
Blethyn, Albert E.
Bone, Arthur
Burroughs, George
Cook, Charles
Crathorn, Ernest
Davies, James
Drinkwater, Herbert G.
Fitton, Leonard
Ford, Albert
Freeman, Norman W. H.
Garrud, Thomas V.
Gelleff, Arthur A.
Grimsby, William
Godbehear, Harry C.
Hargreaves, James
Hickson, Charles E.
Hobbs, Sidney
Hodgson, William
Holben, Arthur R.
Houghton, George E.
Hyde, John
Johnson, Jason H.
Johnston, William
Jones, Arthur
Jones, Arthur B.
Joyce, John G.
Kinder, Harold
Main, Arthur H.
Mechen, Arthur
Merchant, Ambrose C.
Millard, Fred. H.
Morsman, Alfred
Mosley, Cyril
Newcombe, Herbert G.
Parry, John E.
Pocock, Charles H.
Pogson, Harold
Prentice, Fred. W. L.
Pressman, Alfred E.
Roberts, Robert
Seed, George
Smith, Ernest T.
Steer, John F.
Stott, Harold
Taylor, Paul H.
Treby, George
Trobe, Norman
Tucker, Stanley A.
Vickers, Ernest
Walker, Harold S.
Wells, William E.
West, Ernest A.
Woodley, Charles A.
Yates, Charles

Exhibits at the Royal Show.

Apart from the large display by Messrs. Crossley Bros., Limited, to which reference was made in the "Journal" last week, there was nothing of particular interest from the gas engineering standpoint in the exhibits at the Royal Show which concluded at Nottingham on Saturday. There were, however, many evidences forthcoming of the latest application of oil-engines for motive purposes in relation to agricultural appliances; and for one of these, an oil-engine, for double engine cable ploughing, the Society's silver medal was awarded to Messrs. Walsh and Clark, Limited, of Guiseley. Adaptable also as an agricultural traction engine, the motor is of the two-cycle type. One of the claims made in regard to the invention is that it is the only traction motor capable of being stopped under load and again set in motion without disconnecting the friction clutch. Messrs. Blackburn and Co., Limited, of Stamford, after exhaustive tests, secured another of the four silver medals given this year; their success being for notable improvements in an oil-engine. They had won similar recognition at the Park Royal Show in 1904, for a governor for oil appliances.

ELECTRICITY SUPPLY MEMORANDA.

THERE are mixed feelings in the electric supply industry to-day. There generally are; but they are more mixed than usual just now. July 1 saw the announcement by various electric-lamp firms that they were placing on the market domestic "half-watt" lamps, which we anticipate, when put under photometric test, will prove to have no more claim to a candle-per-half-watt efficiency than their larger unit predecessors. For ordinary pressures—200 to 255 volts—it seems that for domestic purposes the makers have not yet got lower than 200-candle power, which it is claimed can be obtained "for a consumption of 100 watts only." If precedent stands for anything, one or other of these figures is wrong (perhaps both). There are not many 100 to 130 volt circuits in this country, unless private generating plant is employed, or transformers are brought into play. Of course, the lamps can be used connected-up in series. But for such circuits, a lamp of 120-candle power for 100 to 120 voltages is said to be available, "taking but 60 watts." For pressures of 25 volts, there are lamps taking only 15 watts. In making this announcement, the "Electrical Times" says that larger units for 200 to 255 volts, taking 150, 200, and 300 watts respectively, and other sizes for 100 to 130 volts, have also been introduced. "Meteor" thinks this would be a sensational piece of news were it not for the existence of the war. The lamps (which are argon-filled) have their drawbacks. A unit of 200-candle power for the common voltages is not very likely to be a popular one; and if two of the (100 to 130 volts) 120-candle power lamps are installed in series, the position is worse. Anyway, the lamps for domestic use would have to be shaded-down by eye-protecting devices, and thus efficiency in relation to consumption would be depreciated from the point of view of useful light. In fact, our contemporary acknowledges that "the new lamps should be used with special lanterns when employed for outdoor lighting, to allow of adequate ventilation and protection from the weather; while for use in private residences, especially on high voltages, semi-indirect or indirect lighting fittings seem to be called for to eliminate glare." "Seem to be called for!" Our contemporary might safely be a bit more positive. The 200-volt 100-watt lamp is listed at no less than 12s. 6d.; and the size is 6¼ in. from the pip to the cap by 3⅜ in. diameter through the bulb. There is still hopefulness on the part of some electrical people that the lamp manufacturers will succeed in getting lower still in unit size; but the managers of electricity supply concerns in residential areas devoutly hope they will not, for bankruptcy or a considerable increase in the price per unit would have to be faced. For them, any further increase of efficiency will mean a complete upheaval of all the conditions on which their stations have been built and run, and business conducted.

Domestic "Half-Watts" on the Market.

Changed Opinions.

There has been a slight reverse in the House of Commons Committee Rooms for the Northumberland clause in connection with the Southampton Corporation Electric Lighting Order, which proposed an extension of the supply area. It was the Committee presided over by Sir Edwin Cornwall (as our "Parliamentary Intelligence" last week showed) who rejected the application made by Mr. A. M. Paddon, on behalf of the Southampton Gas Company, for the insertion of the clause. Parliamentary warfare, in connection with matters of this kind, is always more or less vacillatory. It is not the first time that the Northumberland clause has been refused; but applications for the insertion of it, or of its successor (the Winchester clause), have been more frequently granted than rejected. The Southampton Corporation were keen against not having the clause put upon them; and they brought up Sir John Snell, the President of the Institution of Electrical Engineers, to support them. Why they took all this trouble is not explained. If they carry on their trading in a business-like way, there can be no possible reason why the presence of the Northumberland clause should interfere with them. But they excused their opposition to the insertion of the clause on the ground that, with the clause in existence, it would be impossible to enter into long-period contracts for power supplies at low rates. There is not the slightest reason why the clause should affect such contracts. It is not good business to enter, for a considerable period, into contracts in which all contingencies are not provided for either in the price itself or by some condition in the contract. Sir John Snell himself stated that, in a contract which had been entered into by the Corporation at such a low price that they asked to be excused from making disclosure of the terms even to the Committee (which to say the least looked strange), he should have preferred to see a coal clause inserted, so that the price could be readjusted to altered coal conditions. There is more reason than ever now why municipalities should be compelled to conduct their electricity business so that one class of supply is not a charge, or rather part charge, upon another class of supply. Coal, oil, and materials generally are all dearer than they used to be; and carriage, labour, rates and taxes, and other expenses are heavier—in fact, there has been a complete change towards sterner conditions. In view of this, there is all the more need for protecting ratepayers against commercial mismanagement. Sir John Snell used to think this. He thought so in 1911, when the Winchester clause was put upon the Winchester Corporation—partly due to Sir John's evidence. In his Presidential Address to the Institution of Electrical Engineers, he showed the absurdity of electrical engineers claiming to be able to supply at ½d. per unit—all expenses told. He informed the Southampton Corporation not long ago that, while the supply of electricity at ½d. per unit for heating and cooking was not doing harm to the undertaking just then, he advised the discontinuance of the practice, and instead the establishment of a fixed charge tariff, *plus* ½d. per unit. The recommendation speaks louder than all else. Now, Sir John comes along, and says his opinion has changed since 1911, when he gave evidence for the Gas Company in the Winchester case. Does this mean that in 1911, Sir John's consideration of the question had been of such an immature character that he helped them to do something which he ought not to have done? It seems that the attitude he now takes up is that, if the Northumberland or Winchester clause is enforced, further losses would be incurred by increasing prices. We do not follow Sir John in this. Business ought not to be conducted in such a manner that losses occur. But here we have the President of the Institution of Electrical Engineers setting up the theory that unbusiness-like and profit-losing methods, if readjusted on a sound financial basis, would make the position of a concern worse. At any rate, we understand that this is his contention; and we leave him with it. Sir John appeared in the Long Eaton preferential charge case, and supported the action of the Council in what they were then doing. The result of that case is well known.

"Natures" of the Members of the I.M.E.A.

The Institution of Electrical Engineers is usually the butt of the critics of organized effort in the electrical industry. For some time past the enthusiasts of the industry have given up all hope of seeing the Institution taking part in any forward movement; and they have in consequence been looking to other bodies to take the initiative—for example, the Incorporated Municipal Electrical Association. But this body has not been very successful in the part it has essayed to take in the so-called forward movement. Illustrating this is the Bill the Association promoted in Parliament, and which it was thought would be the Magna Charta of the municipal electricity industry through the conferment of extended trading liberties. The measure has now got the dust of years upon it; and it has made no progress. The Association, too, took upon itself the task of canvassing for subscriptions for the maintenance of the defence to the action in which the Ilford Council were brought to book for adopting illegal trading procedure. After endeavouring to get money sustenance for the Council, the Association had the mortification of finding that they had been proposing to support something that had not behind it a shred of statutory justification. Now "An Engineering Correspondent" of "The Times" lashes about him in a most unmerciful manner, with a view, as he says, to stimulate a livelier spirit in the Association. He does not think the pace of members is fast enough; and, in fact, with the exception of a few, he is of opinion that the members have not the wherewithal within their natures to show any real go. Gems from this piece of character reading on the part of "An Engineering Correspondent" are worth giving. He asserts that the Association appears deficient in both commercial push and professional enthusiasm. While admitting that there are a few representatives of genuine and ardent business aptitude, he indicates that there are far too many others who are merely content to avoid mistakes, and to adopt only methods and machines that have been proved safe by long trial elsewhere. "They cannot be expected to reform their natures; but they can do much otherwise to accelerate general progress without personal risk. For example, they may refrain from purely dialectical or mathematical opposition to the enterprise of their more courageous professional brethren. It is always easy to describe mere difficulties, and to present reasons for not doing something which is in some degree speculative. But it is much more to the advantage of the electrical supply industry that those managing engineers who are eager to force the pace should be encouraged." It is clear from this that "An Engineering Correspondent" would like to see the members a bit more speculative, rather than pursuing development with prudence. Speculation has not proved itself a good friend to the electricity supply industry, as witness the pile of *débris* to be found in its historical record. It is clear, however, that there is little hope for stimulating the Association until a new generation of members comes along, seeing that the present ones "cannot be expected to reform their natures." It would be illogical to submit otherwise.

The I.M.E.A. Bill and Systems of Charging.

It will be remembered there was some talk last year as to the promotion of a Joint Bill by municipal authorities with the view to obtaining from Parliament the wiring, hiring, and fittings powers which the Incorporated Municipal Electrical Association have failed to secure for them through the Bill which has had such a weary wait in and about the Houses of Parliament. It seems from the report of the Council of the Association that the suggestion of a Private Joint Bill by local bodies for the purposes in view did not "take on." The observations by various authorities in reply to a circular-letter were not at all encouraging; and so action came to a dead-end. Reluctantly the Council returned to the old soiled-with-age Bill. But there is a proposal to freshen this up with a point which must be narrowly watched—that is to say, a proposal to insert a clause authorizing special systems of charging based upon electrical assessment. It is not clear what the Council are after in this connection; but it would be well to look closely into the matter when, if ever, an amendment is made in the draft Bill. The Council, as is known, made themselves busy over the Ilford preferential charges and fittings case. It appears that the Association were asked to support the Borough Council. This the Association did, by taking the very questionable course of begging contributions to the costs that were being incurred by the Ilford Council. It is stated that "considerable financial support was promised in response." What a lot of numskulls they must have been who promised support to a case which had such a shocking ending—on every point, proved and admitted illegality. It is interesting to note that Mr. Faraday Proctor, the Electrical Engineer of Bristol, and Hon. Secretary of the Association, has examined the tariffs of over a hundred electricity undertakings, and is of opinion only a few could have been the subject of attack. We do not know what legal qualifications Mr. Proctor has for judging these things. Sir John Snell and the electrical engineers of Long Eaton and Ilford came a cropper over the matter. Why not Mr. Faraday Proctor? It appears that the doubtful tariffs are being amended, or amendment is under consideration. We repeat that it will be necessary to keep under observation (so as to see that it does not affect fundamental statutory principles) the question of introducing a clause in the Association's Bill authorizing new systems of charging.

Capital and Economy.

Most of the electrical papers now seem to have completed their description of the electrical equipment at the Regent Palace Hotel. Naturally they are all elated over it, most of them to the extent of several columns; but amid it all room has been found for two words which indicate that gas and coke have a large part in the work of the huge kitchens. "Electrical Industries" makes a point of the economic principle regarding "the soundness of spending capital freely to achieve economy and efficiency in working." Our contemporary ought to have qualified this, as the electrical industry supplies numerous instances of the unsoundness of spending capital freely, inasmuch as it has not always resulted in economy and efficiency, but has imposed an all too heavy burden on the undertaking, represented by deficiency of profit which in one case has to be met by the ratepayer, and in the other case does not contribute to the happiness of the shareholder. In other instances, free capital expenditure may be quite a lucrative investment; but our contemporary seems to think that spending money on electric-fires is an economy-promoting act. "Electric-fires," it says, in every one of the thousand and odd bedrooms in the Regent Palace Hotel, "seem a luxury until one reflects upon the saving in labour which results." What "seems" to be may be an actual fact. Saving in labour may be purchased too dearly by the outlay of capital. At the best, the installation of electric-fires is an expensive thing; and the maintenance charges of a thousand and odd such "fires" will be great. We saw last week that at Marylebone a rental equal to one-half the first cost is charged per annum for electric-fires. Then, with a very cold winter, occupants of the bedrooms, with *ad libitum* use of the electric-fires, will not trouble their heads as to how long or how often they use them. Assuming a thousand of the bedrooms occupied on a cold day, in one hour, with the fires going at full power, 1500 units of electricity would be metered through their use; and night and morning no care would be exercised by many of the migrant tenants as to the number of hours of use. Many people will use the fires who would not have a fire of any kind for which they had to specially pay. Considering all things, we are not satisfied that the electric-fire, with all its expenses—initial, maintenance, and running—is going to produce any monetary economy for the Regent Palace Hotel. At any rate, Messrs. Lyons and Co. have the means of making comparison, through the ownership of other hotels.

The Half-Watts and Photometrical Difficulties.

It appears that in the testing of gas-filled (or half-watt) electric-lamps, our photometrical friends at the National Physical Laboratory have found some fresh colour difficulty. In the recent annual report of the Laboratory, it is stated that the development of suitable sub-standards for use in the testing of the gas-filled electric lamps is becoming an urgent matter. Experimental standards have already been made up for the Laboratory by the Osram Lamp Works, and are being thoroughly tested before duplication into complete sets of standards. The cascade method adopted at the Laboratory for the realization of candle power in white light will be eminently suited for extension to these sources of light of still higher efficiency. Four sets of gas-filled standards are required to bridge the colour interval between the present highest temperature standards operating at 1·5 watts per candle, and those required in testing nitrogen-filled lamps. Their preparation and standardization are to be pushed forward during the year.

The Hon. Sir Edward Chandos Leigh, K.C.B., K.C., late Counsel to the Speaker of the House of Commons, who died in May, aged 82, left unsettled estate valued at £35,409 gross, with net personalty sworn at £35,087. Among the private bequests were £5000 to each of his sons—both killed in action.

A GAS COPPER-MELTING TEST.

The Furnace Exhibition at Newcastle-on-Tyne promoted by Messrs. John Wright and Co., of Birmingham, and the associated firm of the Brayshaw Furnaces and Tools Company, Limited, was visited by the Newcastle and District Association of Foremen Engineers and Mechanical Draughtsmen; and the members who accepted the invitation had not only an instructive evening, but also a very enjoyable one.

Among the various operations carried out was the re-heating of case-hardened samples of steel; and these were afterwards broken in a press to show the fractures. The strength of the core and the depth of the hardened portion were apparent. Another section of the company witnessed the hardening of ordinary carbon tool steel in the salt-bath furnace; while still others were interested in the heat treatment of high-speed steel. A number of carbon steel bars were hardened at a known measured temperature, and when fractured a beautifully silky texture equal to high-speed steel, and extremely tough to break, was the result. The bars were quenched in a patent fusible salt "Quenchite," at 140° C. This method of quenching gives unique results when treating taps and reamers; and it is said that thousands can be hardened without the risk of a single failure. The furnace used for the high-speed steel was of the twin-chambered variety. The upper chamber, used as a pre-heater, is heated by the waste heat from the lower chamber.

Those concerned with the heat treatment of high-speed steel will realize the importance of using specially-designed furnaces for the correct heating of this work, when it is pointed out that, after the particular samples used were placed in the heating chamber, the correct temperature was reached in less than thirty seconds. The samples were quenched out in a fusible salt "Feusalt," which is claimed to give great endurance, and eliminate risk of warping or breaking. This process also results in freedom from scaling and oxidizing, and enables high-speed steel cutters to be used for the most accurate work.

Perhaps the most interesting feature of the evening was an actual test in melting copper in an improved type of furnace which the manufacturers have recently introduced. Two scrutineers were appointed by the visitors to supervise and take the figures; and 61 lbs. 7 oz. of pure metal was placed in the crucible, and heated to pouring-point in 27 minutes, with a gas consumption of 130 cubic feet; this being at the rate of 2·11 cubic feet of gas per pound of copper dealt with. The members expressed surprise and great appreciation at the results achieved.

A vote of thanks to the promoters was proposed by the President (Mr. Norman M'Manus) and seconded by the Vice-President (Mr. Taylor), and suitably supported. It was pointed out by the visitors that they were pleased to see the close co-operation that there had evidently been between the gas engineer and the mechanical engineer in producing these particular designs of furnaces—designs which, in actual practice, had that day proved to them that gas-furnaces were no longer a hobby or a fad, but a sound commercial proposition.

The Late Mr. Gordon Walker.

Masonic readers will remember that an appeal was recently made to them to reserve their votes for the next election of the Royal Masonic Institution for Boys, on behalf of the two sons of the late Mr. Gordon Walker, of Wantage. We now learn that intimation has been sent to the friends who were interesting themselves in this case that both boys will be admitted to the Institution without election.

National Physical Laboratory.

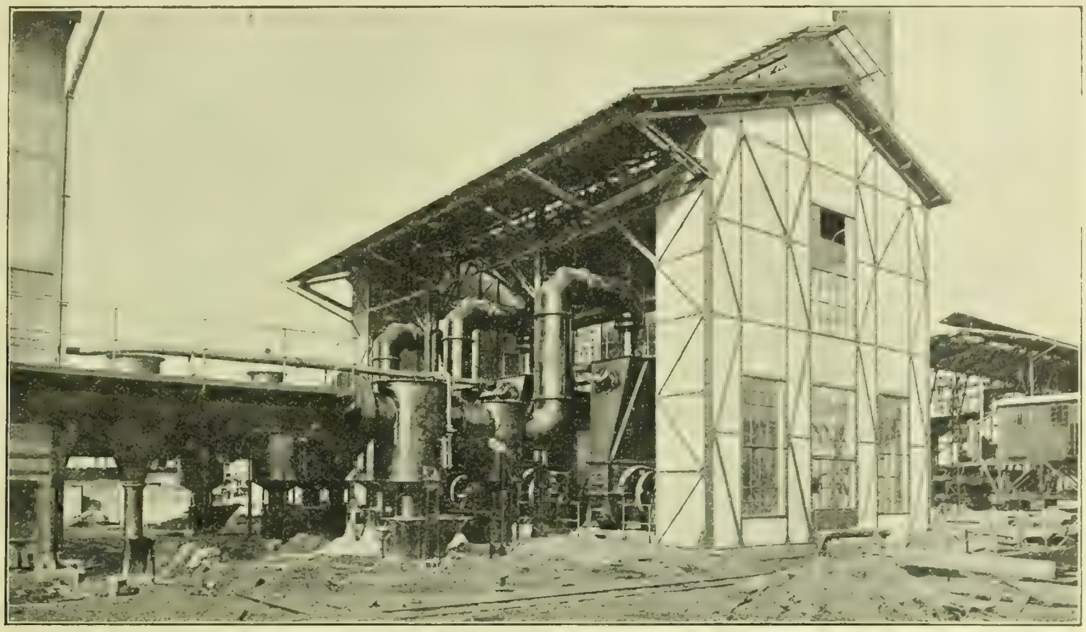
The annual meeting of the General Board of the National Physical Laboratory was held in the Royal Society Rooms last month, when the annual report and accounts for the year 1914-15 were adopted for presentation to the President and Council of the Royal Society, and the programme of work for the coming year was approved. Some extracts from the report were given in the "JOURNAL" for June 22, p. 692. This year the usual gathering of visitors at Teddington, to meet the members of the General Board and to inspect the Laboratory, will not take place, as 25 per cent. of the staff are away on active service.

Oil and Gas Prospecting in North America.—In the course of an article on "Prospecting for Oil and Gas in North America," Mr. Charles N. Gould draws attention to the importance of the assistance which can be rendered by the geologist in connection with such work. He contends that, though there are no absolute data for arriving at an accurate conclusion, the best estimates available would indicate that of the wells located without geological investigation not more than 5 per cent. are successful, while of those located by geologists as the result of careful work about 65 per cent. yield fine oil or gas. Not all of them, however, find these products in paying quantities, because there are certain things which neither the geologist nor any other man can tell from the surface.

THE NEW GAS-WORKS AT BUDAPEST.

By M. ISIDOR BERNAUER, the Manager.

[Abstract-Translation of a Description in the "Journal für Gasbeleuchtung" for May 8, 15, 22, and 29.]



THE PRODUCER-GAS CLEANING PLANT AT BUDAPEST.

[For Other Illustrations of the Works, see "JOURNAL" for Feb. 24, 1914, pp. 498 to 500.]

HISTORICAL.

A concession granted in 1855 by the Corporation of Pest to two Germans for the supply of gas to the town for a term of twenty-five years was transferred by them to the General Austro-Hungarian Gas Company, which was founded by certain financiers of Trieste and Vienna. One of the original concessionaires, Ludwig Stephani, of Mannheim, built the first gas-works, in the Józsefváros (now No. VIII.) district for the new Company, and distribution of gas began on Dec. 23, 1856.

The Company obtained concessions in 1866 from the town of Buda, and in 1871 from Obuda. In the former year they erected new gas-works in Buda, which served later also for the supply of Obuda. In 1872, a contract was made by the Company with the suburb of Ujpest, and a small gas-works was erected there. The three towns of Pest, Buda, and Obuda were amalgamated in the year 1873 to form the City of Budapest.

In order to meet the increasing gas consumption, new works were erected in 1884 in the Ferenczváros (IX.) district on the Pest side of the river; and in 1900 further works were built separated from this one only by a street. The five works enumerated served to supply Budapest with gas until the concessions of the General Austro-Hungarian Gas Company expired on Dec. 15, 1910. The gas consumption increased especially rapidly in the last three years of the Company's operations, reaching 2225 million cubic feet in the year 1910. At that time the output was equal to the maximum productive capacity of all the works—viz., very nearly 10 million cubic feet per diem. The Company naturally had not expended money on extensions in the years shortly before the expiration of their term of supply, and the plant was to a large extent rather antiquated and worked by manual labour. Moreover, owing to the growth of the city, the Józsefváros and the Buda works were by this time in the midst of closely-built districts, and the Ferenczváros works were on comparatively small sites of which extensions were almost out of the question, owing to their being bounded on all sides by streets. Consequently, when the Corporation took over the gas undertaking in 1910, the first question was the construction of new large gas-works.

The Corporation appointed Dr. Franz Heltai, who was subsequently Lord Mayor, General Manager of the gas-works, with the author (Isidor Bernauer) and Viktor Schön as technical collaborateurs. A detailed scheme for a new gas-works was drawn up by them; and this was submitted to a Committee of native and foreign experts who approved of all the more important proposals. In accordance with this scheme, the Corporation decided to abolish the Józsefváros and Buda works, and to erect new works, ultimately to have a productive capacity of 3530 million cubic feet per annum, on a site in the Obuda (III.) district. Provisionally, the works would be erected for a productive capacity of 8,825,000 cubic feet per diem. The preparation of plans and estimates for the construction of the new works was entrusted to M. Albert Weiss, the Manager of the Zürich Gas-Works, who had the assistance of MM. Bernauer and Schön. The plan and estimates prepared accordingly were submitted to a Technical Committee, who approved them; and they were then adopted by the City Council, who voted a credit of 40 million kronen (£1,667,000) for the construction of the new works and incidental work.

TEMPORARY MEASURES.

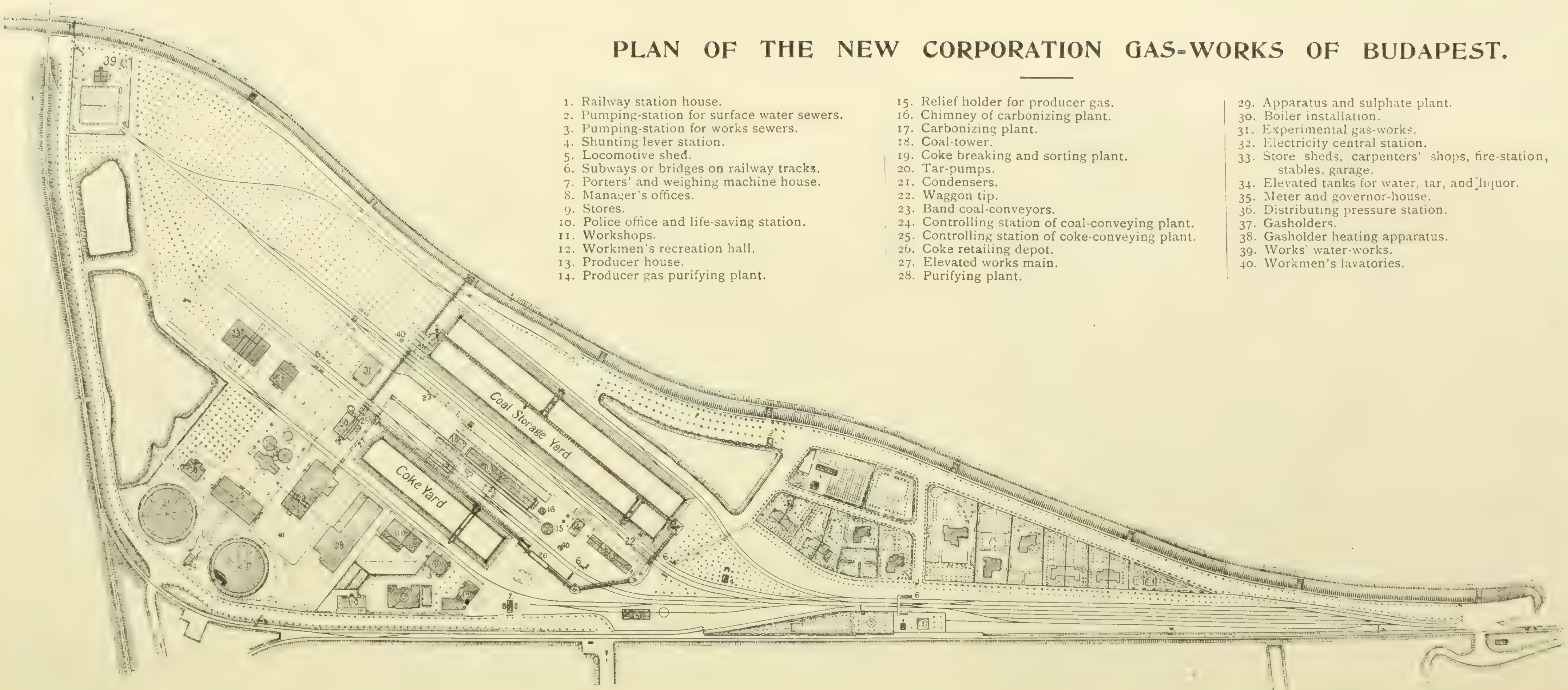
Having regard to the fact that the consumption at the time of taking over the old works had already reached their full productive capacity, it became necessary to take steps to increase the latter to meet the growth of consumption until the new works were ready. The steps taken included the erection of a new gasholder of 2,120,000 cubic feet capacity in the Lipótváros (V.) district on the Pest side of the river, with high-pressure mains leading to it, and a new 40-inch distributing main to convey gas from it to the town. A compressor of 106,000 cubic feet per hour capacity was installed for pumping gas from the Józsefváros works to this new holder. Notwithstanding that the Buda works were to be abolished, it was found necessary, as a temporary measure, to erect a new holder there of 635,000 cubic feet capacity and a distributing governor for a 24-inch main. When the works should cease to be used as a manufacturing station, this gasholder and governor would continue to be employed for distributing purposes.

At the first of the Ferenczváros works, new condensers, exhausters, washers, purifiers, station meter, and the necessary boilers and buildings, were provided for a capacity of 2,470,000 cubic feet per diem, which additional plant admitted of the existing retort installations being worked to their full capacity. At the second of the Ferenczváros works, it was decided, in order to increase their output and at the same time get information of value for their subsequent reconstruction, to instal two settings of Woodall-Duckham continuous retorts, having a productive capacity of 424,000 cubic feet per diem, together with all the necessary plant for the subsequent treatment of the gas made in them. Finally, in order to increase the area available for the storage and handling of coal and coke at the two works, a piece of land, separated from them merely by a street, was taken for use as a coke storage and screening yard.

These measures sufficed to enable the old works to meet the increasing demands for gas during the years 1911 to 1913. The consumption in 1913 was 32 per cent. more than in 1910. The distributing system, as taken over from the Company in December, 1910, had a length of about 374 miles, and a cubic capacity of about 470,000 cubic feet. But it was much obstructed by naphthalene deposits. There were no naphthalene washers in the old works, and high heats were adopted in order to force the output of the settings. The result was that when the City took over the gas supply, naphthalene obstructions gave rise to very numerous complaints from the consumers. The Corporation therefore started naphthalene extraction by washing, and laid many new large mains and cleared some of the old ones. By the end of 1913, the mains had been increased in length by 24·42 per cent., and in cubic content by 73·68 per cent., compared with the end of 1910. The expenditure on the mains in the three years was about £208,000.

It had been intended to utilize the two largest holders at the

PLAN OF THE NEW CORPORATION GAS-WORKS OF BUDAPEST.



1. Railway station house.
2. Pumping-station for surface water sewers.
3. Pumping-station for works sewers.
4. Shunting lever station.
5. Locomotive shed.
6. Subways or bridges on railway tracks.
7. Porters' and weighing machine house.
8. Manager's offices.
9. Stores.
10. Police office and life-saving station.
11. Workshops.
12. Workmen's recreation hall.
13. Producer house.
14. Producer gas purifying plant.
15. Relief holder for producer gas.
16. Chimney of carbonizing plant.
17. Carbonizing plant.
18. Coal-tower.
19. Coke breaking and sorting plant.
20. Tar-pumps.
21. Condensers.
22. Waggon tip.
23. Band coal-conveyors.
24. Controlling station of coal-conveying plant.
25. Controlling station of coke-conveying plant.
26. Coke retailing depot.
27. Elevated works main.
28. Purifying plant.
29. Apparatus and sulphate plant.
30. Boiler installation.
31. Experimental gas-works.
32. Electricity central station.
33. Store sheds, carpenters' shops, fire-station, stables, garage.
34. Elevated tanks for water, tar, and liquor.
35. Meter and governor-house.
36. Distributing pressure station.
37. Gasholders.
38. Gasholder heating apparatus.
39. Works' water-works.
40. Workmen's lavatories.

Józsefváros works as storage holders after these works had been done away with as a manufacturing station. On examination, however, they were found to be in bad condition; and it was decided therefore to build a new holder of 5,300,000 cubic feet capacity on a fresh site in the Köbányaváros (X.) district on the Pest side, to take the place of the old holders. This holder, the erection of which was begun in the spring of 1913 and finished last autumn, is supplied through a 32-inch main from the Obuda works, and is connected by a 48-inch distributing main with the district. A special credit of £167,000 was voted by the Corporation for the erection of this holder, including the cost of the site, mains, governor, &c.

The New Obuda Works.

The site of the new works is on the right bank of the Danube, adjoining the branch on which are the shipping wharves, and directly below the bridge of the railway from Pest to Esztergom. The place is known as Homokos-Ried, and is close to the ancient Roman colony of Aquincum. The site is a long triangle, bounded on the north by the embankment of the Esztergom railway, on the east by the Obuda and Császárfürdö junction line, and on the south-east by the branch of the Danube. It is thus cut off from neighbouring ground. The site was at one time part of the land which was flooded by the Danube. The subsoil consists of sand, loam, and Danube ballast. The underground water is not very copious, but its level is comparatively high—varying between 13 and 16 feet above the mean level or datum of the Danube. The ground level was nearly 27 feet above the mean level of the Danube at the suspension bridge in Budapest, or nearly 317 feet above sea level datum of the Adriatic Sea. The site had to be protected from floods by dykes 32 ft. 2 in. high; and the ground level was raised by tipping ballast, taken from the bed of the Danube, to an average depth of about 80 inches. Its area is about 99·82 acres, which is ample for gas-works of about 35 million cubic feet per diem productive capacity. The construction of the dyke and the raising of the level of the ground were begun in October, 1910.

The arrangement of buildings and plant on the works naturally depended largely on the shape of the site and on the railway connection. The disposition adopted is shown in the annexed plan of the works (fig. 1). Since supplies of coal might be received either by rail or water, the coal-store and settings were arranged parallel to the Danube; and the apparatus and other works' buildings were at right angles to them. For handling the traffic, railway tracks have been provided, having a total length

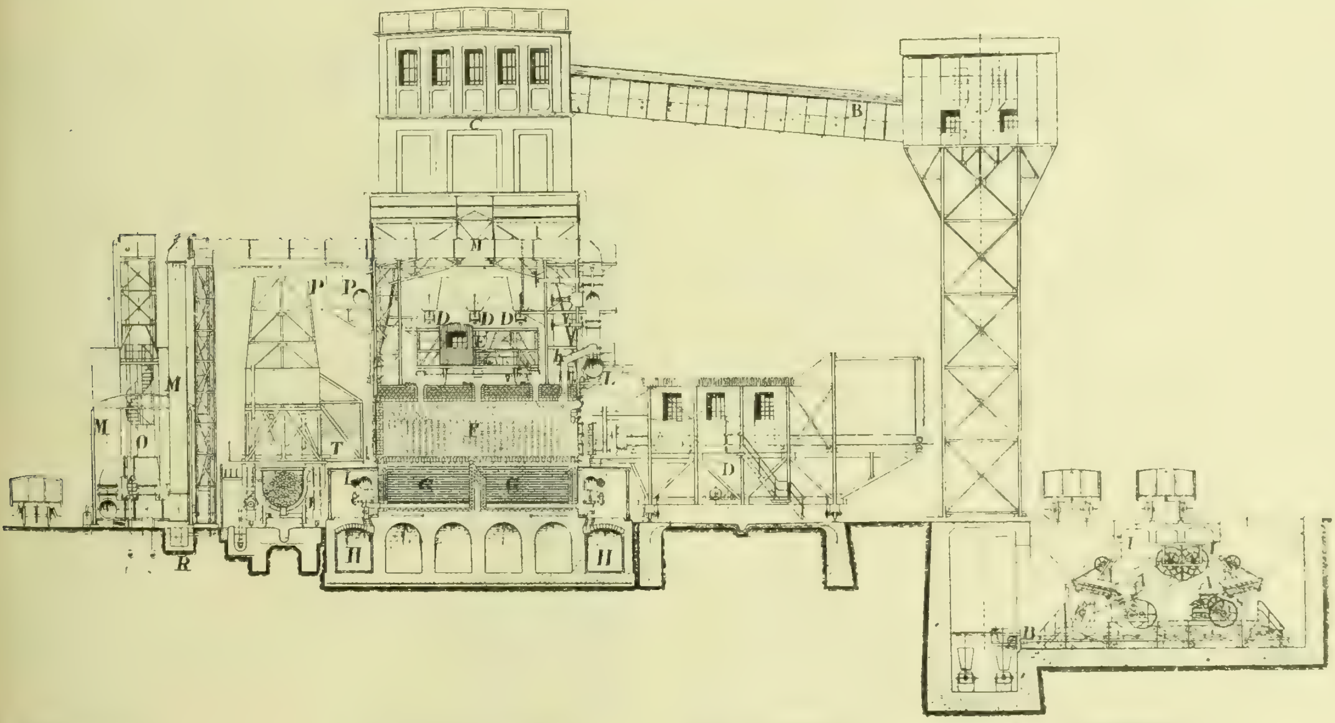
THE CHARGING STAGE OF THE PRODUCER HOUSE.

of about 6¼ miles. They are connected with the Angyalföld junction curve of the circular railway on the right bank of the river, and switches thus give direct communication with either the Angyalföld or the Obuda stations. There is a single track connecting line, which communicates with six tracks of sidings, each 550 yards long, and with nine tracks for traffic about the works. The incoming trains are taken over at the works' railway station, and from this point are handled by two shunting locomotives belonging to the works. Each of the sidings will accommodate thirty of the 20-ton waggons. There is a special platform for the passenger traffic.

The plant installed on the works for the time being is designed for a maximum productive capacity of 9,532,000 cubic feet per diem; but it has been so arranged that extensions can be carried out to raise the output to 35,300,000 cubic feet without causing any interruption of working. Ultimately there will be two coal-storage yards; but at present only the southerly one has been provided. This yard has a length of 1050 feet and a width of 230 feet, and is divided lengthwise into two halves by the large bridge of the conveying plant. It has a concrete floor, and when the coal is heaped to a height of 26 ft. 3 in., it will store nearly 120,000 tons. This would suffice for nearly three winter months' requirements for a maximum daily output of 17,500,000 cubic feet of gas.

Carbonizing Plant.

Alongside, and parallel with, the coal yard is the carbonizing plant, which consists of horizontal ovens or large chambers on the Koppers system. The choice of these ovens was largely influenced by observation of the installation of them at the Leopoldau works at Vienna. But certain changes were made as the result of the experience gained there. The Obuda installation comprises



A. Coal-breakers.
B. Band conveyors.
C. Bunker.
D. Shoots.
E. Charging waggon.
F. Carbonizing chambers.
G. Regenerative system.
H. Main flues.
I. Producer-gas main.
K. Coal-gas main.
L. Hydraulic main.
M. Foul-gas main.
N. Condenser.
O. Governor.
P. Works main.
R. Tar overflow.
S. Expelling machine.
T. Quenching tower.
U. Quenching waggon.

INSTALLATION OF CARBONIZING OVENS ON THE KOPPERS SYSTEM AT THE OBUDA GAS-WORKS AT BUDAPEST.

78 chambers, which are in four benches—two of nineteen chambers and two of twenty. Each chamber is 32 ft. 10 in. in length, 17¾ inches wide, and from the base to the top edge of the masonry 9 ft. 10 in. high. They are charged through three openings at top, and the charge is exactly 10 metric tons (9·84 English tons). The Koppers system of heating puts vertical heating passages between the chambers and the regenerative system underneath. One-half the chamber is heated at a time; the spent gases passing into the regenerative system of the other half. This order is reversed every half hour; the gases taking the opposite direction and the other half of the chamber being directly heated.

The chambers are charged with coal from a coal-tower erected at the northern end of the settings. This tower is in reinforced concrete, and holds 1200 tons of coal. A charging waggon runs on rails on the stage on top of the settings, and is driven by an electric motor. The charging waggon contains three bunkers, with funnel-shaped openings corresponding with the charging openings of the chamber ovens. For charging, the waggon is driven under the coal-tower, filled with coal by opening sliding valves, driven back to the chamber which has to be charged, and, on raising a lever, the charging funnels are opened and the coal is discharged into the chamber. The conical heaps of coal under each charging opening in the chamber are levelled by a device which is carried by a waggon that travels in front of the chambers. The doors of the chamber are then shut, and the charging operation is finished.

Coke Discharging and Handling.

The charge is left in the chamber for twenty-four hours, when carbonization is complete. The doors which close the ends of the chamber, and are lined with fire-brick and water-cooled, are then raised by cranes attached to the discharging machines which travel on rails in front of the benches. The machine on one side contains a strongly constructed ram or pusher-head by means of which the slab of coke is expelled from the chamber into the quenching waggon, which, with the quenching tower, is placed on the other side of the bench. The quenching waggon is a double-walled trough-shaped vessel, of wrought-iron plates, which travels on wheels in front of the bench. The lower half of the inner wall or lining of the waggon is perforated. The waggon is large enough readily to hold all the coke from one chamber.

As soon as the coke comes into it, quenching water is admitted from a reservoir on the tower into which it has been pumped, and at the same time water is sprayed from overhead sprinklers in the tower on to the top of the coke. In this way the discharged coke is rapidly and thoroughly quenched. The quenching water is then run off through two discharge cocks into an open trough extending the length of the bench and conveying the water to a settling tank at one end. The coke dust deposits in this tank, and the water is pumped again into the tank on the quenching tower for further use. The hood at the top of the quenching tower serves to carry the steam liberated in quenching to a high level, and prevent it causing any discomfort to the men. The whole of the machinery is operated by electric power.

After the coke has been thoroughly quenched, the quenching waggon is driven to the upper end of the bench, where it is turned on its longer axis and so caused to discharge the coke into a pit above the coke-breakers. The broken coke is then raised by two bucket elevators to a tower which contains sorting screens placed over a coke-bunker. The screens consist of horizontal perforated plates to which rotary movement is given. The coke is sorted into four sizes—large, over 1⅘ inches; nuts, 1 inch to 1⅘ inches; small, ⅖ to 1 inch; and grain and dust, less than ⅖ inch. The sorted coke is delivered into separate compartments of the bunker; and from these it can be discharged either into railway waggons passing underneath, or into telpher cars, by which it is conveyed to the coke-storage yard, to the retailing depôt, or to the quay on the Danube.

Retort-Heating System.

In regard to the carbonizing plant, it should be observed that each of the heating walls between two adjacent chambers has a separate regenerative system; so that any one chamber may be brought into action or let down, and the heat of each chamber regulated independently without interfering with the working of adjoining chambers. The carbonizing chambers are heated by producer gas from a central installation of twelve revolving grate Kerpeley producers. Ten of these producers gasify Hungarian brown coal or lignite, and the remaining two are high-pressure producers for the gasification of coke-breeze. A report on the working and efficiency trials of the producer installation has already been given in the "Journal" [see Vol. CXXX., p. 26]. The general arrangement of the whole of the carbonizing plant is shown on p. 23.

(To be continued.)

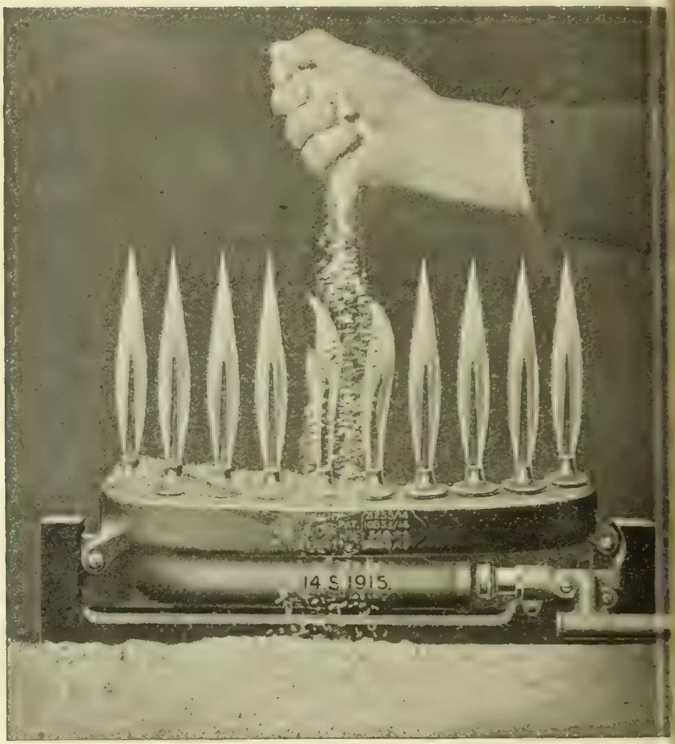
Heating Studentships.—Two Heating Studentships, tenable in the Faculty of Engineering of University College, London, each of the value of £50 a year, together with £11 11s., being the amount of college fees, may shortly be awarded by the Institution of Heating and Ventilating Engineers. Candidates must produce evidence that they have already pursued a course of engineering training, and are familiar with the work of an engineering laboratory. The research students will be required to devote their whole time to research work in connection with heating and ventilating engineering.

THE "INJECTOR-VENTILATING" GAS-GRATE.

Work for Next Heating Season.

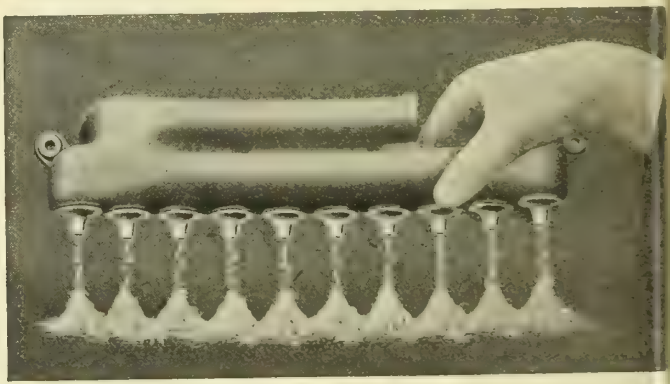
In our editorial columns to-day attention is drawn to the importance of managers of gas undertakings making an especially early move this year to get householders to place their orders for gas-fires for next winter, in view of the difficulties that will then be experienced in connection with the reduced force of available gas-fitters. Attention was called to this matter by Mr. H. James Yates in sending us a booklet explaining the principles and the merits of Messrs. John Wright and Co.'s new "Injector-Ventilating" gas-fire. The booklet opens with the "confident anticipation" that "within a very few years, gas-fires (already in widespread use) will have become as general a 'household word' as coal-grates themselves." There is a strong, but proper, optimism about this passage.

In an article in the "Journal" for Oct. 13 last (p. 75), the

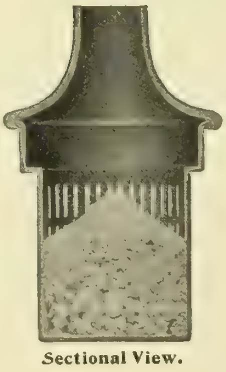


Pouring-in an Excessive Quantity of Grit.

It will be seen that the moment the hand has passed on to the next teat, the flames become exactly as before.

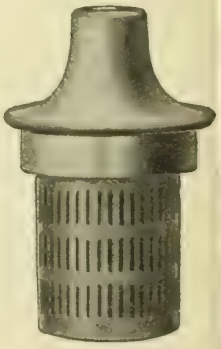


Emptying-out the Grit—Showing the Large Quantity Put in.



Sectional View.

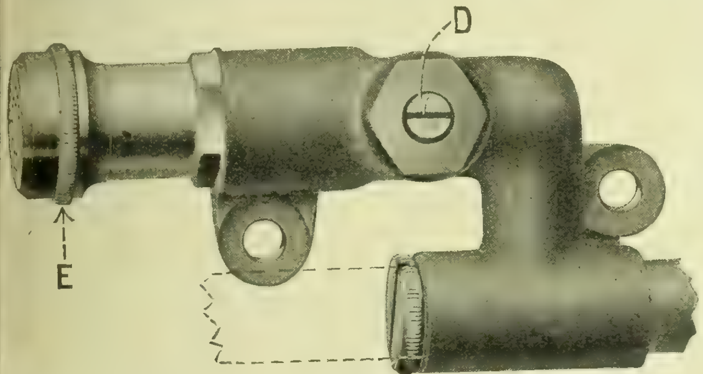
In actual test, even when the thimble was filled with grit up to the point shown, the full quantity of gas continued to pass, and the flame-quality was unimpaired.



Exterior View.

new "Injector-Ventilating Thermo X Gas-Grates" were introduced to our readers. Prior to that, there had been an opportunity of witnessing a number of experiments with fires in which were embodied the new principle; and the results of the experiments supplied us with ground for saying that the construction and effects would, in our opinion, favourably appeal to a public which was being—gradually perhaps, but surely—educated up to the fact that the provision of warmth and the provision of ventilation are two things which should go together at the season of the year when most householders (rightly or wrongly is not the point) consider it necessary to close both doors and windows in order to keep out the external cold or damp atmosphere. Hitherto, upon the coal fire and the soot-coated chimney, there has been a large dependence in the matter of ventilation. Now Messrs. John Wright and Co. submit that their "Injector-Ventilating" gas-grate, with the patent thimble noiseless burner (which is a development of the "Thermo X" fires), is better in the matter of ventilation than coal-fires, because it avoids draughts, while further enhancing virtues are "the radiation is perfect, the burner is absolutely silent under all conditions, without depositing carbon on the radiants." Thus, it is contended that, with such fires, there is nothing to hinder the realization of the long-sought ideal—a gas-fire in every room of every house.

The "Injector-Ventilating" fire has been thoroughly tested since we first described it; and the public experience of last season—including that of engineers, architects, doctors, &c.—has, we learn, fully confirmed the experience and expectations of the firm. In consequence of this, the system has been applied to all the fires produced by Messrs. John Wright and Co., save in the case of the 8-inch fires and all types of dog grate. They have taken this step, because they are persuaded that the invention removes the last barrier to the universal adoption of gas-fires. Those readers who were interested in our original article on the subject—and who of them were not?—will remember that the system provides two openings (instead of one) to the chimney in the upper part of the fire, the lower of which openings carries off the products of combustion, while the upper one carries off a large volume of ventilating air—use being made of the current of combustion products through the lower outlet to promote, by injector action, the ventilating function of the upper outlet. By this means, a ventilating agency is provided which, while it does away with the need for a flue-pipe to the chimney, is as effective as a coal fire, and changes the air of the room several times an hour—in some cases up to as many as six times.



D. Initial Pressure Adjustment. E. Nipple Adjustment.

1915 Pattern Burner Injector Fitting.

(Full Size.)

A feature of the system which is introduced this year, in connection with the "Injector-Ventilating" fires, is the ventilation regulator which is fixed in the upper or ventilating flue.

Regarding the noiseless burning of gas-fires, which is an essential to-day, especially in the case of fires in bedrooms, or rooms in which sick or wounded are being tended, the firm call particular attention to their 1915 pattern burner injector fitting, of which we give a full size illustration. In such a fitting, adjustment means are requisite to deal with initial pressure, calorific value, &c. Such an adjustment, it is stated, permits of the regulation of the aëration of the gas to the degree necessary to equally heat the entire radiant, without causing deposition of carbon. The fitting therefore embodies a distinct initial pressure adjustment so as to ensure silence at the nipple orifice (this being a perfected adaptation from last year), and a second adjustment on the fitting is for regulating the amount of gas issuing from the nipple to suit the calorific value, &c., of the gas. The two adjustments, however, would alone be only partially effective without provision for thoroughly mixing the gas and air. An increased degree of aëration is now rendered possible, without the risk of flame noise, by, the firm claim, their patent perforated thimble, which is fitted inside the teat of each burner. The perforated surface of the thimble, being vertical, does not get choked by grit from the chimney, or by dust and fluff from the atmosphere. Experiments have shown that, when a larger quantity of grit is placed on the thimble than would fall into it in actual use, the extended depth of perforated surface still permits the passage of ample gas for a perfect flame. The advantages of the patent "Thimble" noiseless burner are summed up as follows: Perfect in combustion; adjustable for all ordinary distribution pressures, calorific power, &c.; noiseless; non-luminous under all conditions; dirt-proof.

PHOTOMETRIC DEFINITIONS, STANDARDS, AND METHODS.

Some American Proposals.

The June issue of the "Transactions of the American Illuminating Engineering Society" contains the text of a paper presented at a meeting of the Philadelphia Section held on May 21, by Mr. Herbert E. Ives, who remarked that a series of studies in photometry—more particularly in connection with lights of different colour—had led him to suggest the adoption of a new standard of luminous flux and of a definite photometric method in heterochromatic photometry. The steps leading to these suggestions, and the arguments in favour of their adoption, were given in papers listed in a "Bibliography" at the end of his communication. What was presented for publication in the "Transactions" of the Society was a specific set of suggestions in tabular form, to be taken up later for consideration, if desired, by the appropriate Committee of the Society.

Definitions.

Power Consumed by a Light Source = P; expressed in watts, a portion of which is dissipated by radiation, the remainder by conduction and convection.

Power Radiated by a Source = $R = \int_0^\infty R_\lambda \, d\lambda$ = power emitted by a light source in the form of radiation between wave-lengths 0 and ∞, expressed in watts.

Radiation Efficiency = $\frac{P}{R}$ = ratio of the power dissipated as radiation to the total amouut of power consumed by the source. (A pure numeric.)

Luminous Flux = F = radiant power evaluated according to its capacity to produce the sensation of light.

Light Evaluating Factor or Stimulus Coefficient of any radiation is the ratio of the luminous flux, in its appropriate units, to the radiant power producing it, in its appropriate units.

The Luminous Efficiency of any Radiation = L_R = the relative capacity of the radiation to produce the sensation of light, compared with the capacity of the same quantity of radiation of the maximum possible light producing capacity. (A pure numeric.)

> The luminous efficiency of any radiation is the mean value of the luminous efficiencies of its component mono-chromatic spectral radiations. These latter are specified by the luminosity curve of the normal equal energy spectrum, of maximum value unity. The spectral luminosity curve is obtained by the standard photometric method for coloured light photometry.
>
> To a close approximation the spectral luminosity curve is represented by the expression:

$$L_\lambda = A\left(\frac{R_1}{\lambda}\, e^{1 - \frac{R_1}{\lambda}}\right)^\alpha + B\left(\frac{R_2}{\lambda}\, e^{1 \quad \frac{R_2}{\lambda}}\right)^\beta + C\left(\frac{R_3}{\lambda}\, e^{1 \quad \frac{R_3}{\lambda}}\right)^\gamma$$

where

$A = 0{\cdot}999$ $R_1 = 0{\cdot}556$ $\alpha = 200$
$B = 0{\cdot}04$ $R_2 = 0{\cdot}465$ $\beta = 400$
$C = 0{\cdot}095$ $R_3 = 0{\cdot}610$ $\gamma = 1000$

Total Luminous Efficiency of a Light Source = L_T = the relative capacity of the power applied to a light source to produce the sensation of light, compared with the capacity of the same quantity of power in the form of radiation of maximum possible luminous efficiency. (A pure numeric.)

Units.—Luminous flux is connected to radiant power by a numerical evaluating factor. The unit of power is the watt. The present arbitrary practical unit of luminous flux is the lumen. The light evaluating factor or stimulus coefficient is consequently expressed in lumens per watt. If for this evaluating factor is taken the luminous efficiency as above defined, the unit of luminous flux is the same as that of radiant power or applied power—namely, the watt.

In the symbols proposed:

$$P \times \frac{R}{P} \times L_R = P \times L_T = F.$$

In order to go over to the watt as the unit of luminous flux it is necessary to know the:

Mechanical Equivalent of Light = the value of the lumen in watts of luminous flux.

[The lumen is approximately 0·00162 watt of luminous flux, or light watts. The terms "specific consumption," "specific output," &c., involving relationships between watts and lumens, are superseded by the method of defining luminous efficiency, and by the adoption of the watt as the unit of luminous flux.]

The quantities derived from luminous flux—*e.g.*, illumination, luminous intensity, and brightness—are to be defined as at present, with the necessary substitution of the watt of luminous flux for the lumen wherever occurring. It is suggested that the new unit of luminous intensity on the watt basis might be called the "pyr."

METHODS OF MEASURING LIGHTS OF DIFFERENT COLOUR.

Visual Method.—The visual method is specified by the type of photometric instrument, the conditions of its use, and the choice of observers.

The instrument shall be the "flicker" photometer, in which the photometric field shall be two degrees in diameter, with a surrounding field of as large diameter as feasible, of approximately the same brightness. The photometric field shall be maintained at an approximately constant brightness of 0·013 watt of luminous flux per square metre per unit solid angle (the brightness of a white mat surface under an illumination of 25 metre-candles, present practical units).

Precision measurements should be made by a group of at least fifty observers who possess no marked abnormalities of vision, or by a group of not less than five whose average readings are the same as those of the larger group.

[A group of five or more may be considered as constituting a normal eye group when their average value on the following colour difference is equality. Colour A: 72 grammes potassium dichromate + water to 1 litre. Colour B: 53 grammes cupric sulphate + water to 1 litre. These solutions at 20° C. to be contained in matched clear white glass tanks, 1 centimetre in thickness, and measured by the instrument and conditions above, over a standard 4-watt carbon lamp.]

Physical Method.—The characteristics of the average eye may be incorporated in a physical artificial eye, consisting of a radiometer whose spectral wave-length sensibility curve is that of the average eye.

A close approximation to such an artificial eye is furnished by a non-selective radiometer, over which is placed the following solution, in a thickness of 1 centimetre:

Cupric chloride	60·0 grammes
Cobalt ammonium sulphate	14·5 ,,
Potassium chromate	1·9 ,,
Nitric acid (1·05 gr.)	18·0 cc.
Water to	1 litre

This solution should be protected from overheating by the interposition of a layer of clear water at least 2 cm. thick.

SUGGESTIONS FOR RECOMMENDATIONS TO BE MADE BY THE SOCIETY.

The establishment of the watt as the unit of luminous flux, and the development of the precision physical photometer, depend upon the exact determination of the spectral luminosity curve of the average eye. The luminosity curve and the ratio of the lumen to the watt have been determined with considerable accuracy; but to meet the needs of the future, they should be even more definitely fixed.

It is suggested that determinations of these factors would be most appropriately made by the Bureau of Standards, and that, therefore, the Illuminating Engineering Society recommend to the Bureau as specific problems of value to the science of light measurement:

1. A determination of the average spectral luminosity curve by measurements upon at least fifty individuals, by the photometric method above specified.
2. A determination, using the results of the luminosity curve study, of the ratio of the lumen to the watt of luminous flux.

TRENCH OPENINGS AND REINSTATEMENTS.

As has been previously mentioned in our columns, the subject of whether gas and water companies should undertake the complete reinstatement of their trenches, or whether this should be transferred to the road authority, and upon what terms, is receiving increased attention at the hands of municipalities; and a paper at the annual meeting of the Institution of Municipal and County Engineers, last Friday week, dealt with the matter in some detail. The author, Mr. **Reginald Brown**, the Surveyor and Engineer to the Southall-Norwood Urban District Council, in the course of the paper recited the general inconvenience which is experienced by road authorities by statutory undertakings having powers to open the roads, and made certain suggestions as to dealing with the difficulties. We give the suggestions below.

From an administrative point of view, it would probably be best that no one except the local authority should break up the highways. But this idea is unworkable in general practice; and the author is satisfied that with statutory companies such an arrangement is not at all necessary. Let surveyors put forward some plan whereby the difficulties arising from trench openings can be obviated or minimized, then the author feels certain that they would meet with due consideration from the parties intimately concerned. First, as to the present methods.

(1) A company may open, fill in, and maintain for a period of six months.

(2) A company may open and fill in, and the local authority may maintain by arrangement with the company.

In both cases "notice to open" is given, and the surveyor may or may not supervise according to the extent of his district and other duties which prevent him doing so. If the supervision is not given during the opening and filling in, then satisfactory maintenance becomes more or less difficult according to the care and skill of the company's workmen. In urban districts, it might be comparatively easy for efficient supervision to be exercised; but in rural districts such supervision would be out of the question—even in some urban districts it would require the constant service of a special officer. Probably a simple arrangement would be for those who open the roads to pay the road authority for the cost of supervision—as in the case of tramway companies; and if this were done, the companies might be relieved from maintenance. The supervision could be exercised by an intelligent working man used to road construction; so that it would not be a costly procedure. Again, some agreed-upon details as to how such opening and filling in should be carried out would be much more satisfactory both to surveyors and companies concerned; and this will depend somewhat upon the nature of the road and the character of the traffic on same. The author then suggests the following for consideration.

Before any person opens a road, he should not only be required to give the statutory notice, but at the same time should deposit a plan showing the exact position of the trench, with dimensions, and the date on which the work is to be commenced and will be completed, and also stating the purpose for which the opening is needed. These notices should be entered up in a record book for easy reference at any time, and the date noted on which the maintenance terminates, so that if any repairs are necessary within that period the companies can be notified. The latter would be unnecessary if the companies were relieved of the maintenance as previously suggested. All openings to be excavated of the minimum width required for the particular purpose and, if necessary, the sides timbered. All subsoil material to be kept separate from the surface material.

The "filling in" is most important, as upon this depends the future maintenance. One often sees the sides of a trench badly filled in breaking away from the adjoining crust. The object to be aimed at is to get the earth back again into the trench in as nearly as possible the same space as it occupied before disturbance; and the nearer this can be done the better. The only way to do this is to thoroughly "pun" it in thin layers. The method of punning at the present day is not, however, satisfactory, and it depends upon the human equation. Two men with exactly the same weight of rammer will give very different results. It is therefore advisable for companies to be provided with mechanical rammers, and even then for the ramming to take place in layers not exceeding 6 inches in thickness.

The method of filling in near the surface will depend upon the nature of the road covering. Thus in a flint or macadam road there should be a layer of broken hard core, from 4 inches to 9 inches in thickness, solidly punned, and the surface coating applied at least 3 inches thick. This surface coating should not simply be applied within the limits of the trench itself, but should extend over the sides, so as to become incorporated with the adjoining surface which has previously been loosened; the whole afterwards being rolled. In paved roads a little different procedure might be thought necessary; but the author does not think so, if the consolidation is carried out in the manner suggested. The concrete bed and paving could be replaced immediately, but the same precautions should be taken as to carrying both beyond the limits of the trench itself. The author therefore suggests:

(1) Road authorities to supervise all openings; companies to pay cost of supervision and be relieved of maintenance.

(2) Filling in to be carried out by "mechanical" rammers—at proper pressure—in layers of not more than 6 inches.

(3) Surface material to be replaced immediately on a suitable foundation, according to the nature of the roads—both to extend beyond the limits of the trench and be incorporated with the materials of adjoining surface.

DISCUSSION.

Mr. **Brown**, in introducing the paper, said that his idea was to have mechanical rammers worked by compressed air; there being different shaped rammers for the different type of trench.

Mr. **J. W. Horton** (County Surveyor, Derbyshire) referred to the suggestion that, with proper inspection of trenches while they were being refilled, the statutory time for repairs might be relaxed, or indeed abolished. His experience, however, was directly contrary to this. Anyone with experience of the difficulties of restoring sewerage, water, or gas trenches would know that the period of six months laid down by Statute was insufficient; and the municipalities could not afford to do away with, or weaken it, in any way. He knew instances in which first-class contractors, anxious to do the very best work, had been unable to restore trenches in such a way that they could necessarily be relied upon at the end of six months to be as good as the original road. Quite recently the case of a gas-trench came under his notice, not a very deep one, which was still subsiding at the end of twelve months. This was the experience of practically every municipal engineer. No amount of inspection at the time of the reinstatement would give the result required. Further, it was not equitable that the highway authority should incur expense in order to increase the profits of any company, because this would be the effect of the suggestion to relax in any way the control that was given by Parliament. Therefore, he strongly opposed the suggestion that, by mere inspection at the time the trenches were filled in, satisfactory results could be obtained.

Mr. **G. W. Lacey** (Borough Surveyor, Oswestry) said that this was a very difficult subject, and he agreed that it was impossible to get the majority of trenches restored to their original condition in the space of six months. An instance of a trench opening for gas-mains had come under his notice. In spite of its having been rolled three or four times, at the end of two years subsidences were still taking place.

Mr. H. G. Whyatt (Borough Surveyor, Grimsby) said he was at present preparing a report for a sub-committee on the question of the reinstatement of trenches. He did not agree with the author that the statutory period for which gas and water companies were liable to maintain their trenches was six months. From both the Gas-Works Clauses Act and the Water-Works Clauses Act, the company had to reinstate and maintain their trenches for twelve months; and he could not understand why Mr. Brown should have said six months, nor why the previous speakers in the discussion should have accepted this period. Perhaps it was because the Post Office only maintained its trenches for six months that this figure had been quoted. Even twelve months was not sufficient, because he knew of cases where, though the surfaces of the trench appeared to be quite satisfactory at the end of twelve months, at the end of sixteen months some form of crystallization, if he might use the word, had taken place, and subsidence had followed. A difficulty also was where the gas or water company carried out the reinstatement themselves, through a sub-contractor, of a tar-paved footpath. It would be found that the tar paving was put down of such a thickness that it only just lasted the statutory period. The difficulty of the whole question seemed to be that the local authority had no option with regard to maintenance; but at the same time they could make it very awkward for the company by insisting upon a plan and specification being deposited three days in advance of the opening. In Grimsby, however, the Gas and Water Companies agreed with him to reinstate the roadway; but they preferred to do the footpaths themselves, in order to save the trouble of a plan and the three days waste of time due to the necessary notice. Another matter of conflict was as to the charges to be made. If a schedule of prices was based upon small openings, it was far too costly for large openings; while if the schedule was based on the cost of large openings, the corporation lost money on the small openings. In the report which he was now preparing, he suggested that there should be three scales of prices—small, medium, and large trenches. The author had given no indication, except a brief mention, of the sort of mechanical rammer that he would employ and which would suit all depths and widths of trenches. Did he propose to have three or four of these on each job?

Mr. H. F. Gullan (City Engineer, Belfast) said he was quite convinced that it is impossible to restore trenches of any kind, and have no permanent settlement, by mechanical means. It might be possible to do it with a gravel subsoil, but with stiff clay it was impossible. In Belfast at the present time the gas, water, and electric light departments were all municipal; and the respective committees had agreed that the Works Committee should make the final restoration. The actual cost only of the work was charged; and the service had to be maintained by the various committees for twelve months. This insured a good, sound job, and every care was taken that the three departments mentioned were not overcharged for the work.

Alderman Hitchcock (Taunton) said he had endeavoured to come to agreements with the companies concerned in his town for reinstatement of trenches, but had had great difficulty with the gas people. He had tried his level-best with the Manager and the Chairman; but his efforts had fallen through. He would be glad to see an Act of Parliament by which municipalities could reinstate trenches themselves. In order to obtain a satisfactory result, it was essential that every shovelful should be rammed as it was put in; and if the material was wet, but not too wet, and good men were employed, a very satisfactory result could be obtained. The terms upon which he had endeavoured to agree with the Gas Company in Taunton were that they should be charged the actual cost of labour and nothing more. This, he contended, would be cheaper for the Company; but the Manager would not agree.

Mr. W. Harpur (City Engineer, Cardiff) contended that, once a road was opened, it was impossible to restore it to its original condition. Weather conditions had also a great deal to do with obtaining a satisfactory result. There were instances in his city where trenches had been restored as carefully as it was possible, yet after two years the mark of the trench was visible, and there were depressions and undulations all along it.

Mr. J. W. Cockrell (Great Yarmouth) wondered whether there were local meetings of gas, water, and electricity managers to arrange who should be the next to break up a road directly the surveyor had got it into a good condition. In dealing with the Post Office in Great Yarmouth, they originally arranged to charge the actual cost of the work, *plus* 7½ per cent. for supervision and office expenses; but this had been modified so that the 7½ per cent. was not charged.

Mr. Brown, in the course of a brief reply, asked if it were not possible for the Council of the Institution to take the matter up, and make suggestions in order to arrive at some definite specification which would be followed by the companies and authorities concerned in this matter. As to the period of six or twelve months, he did not think it mattered which. The real point was whether it would be possible to so repair the trenches as to relieve the companies entirely of maintenance. He did not regard the present system of forcing companies to maintain trenches for a certain period, after which the results were often not satisfactory to the road authority, as a proper one.

PIPING HOUSES FOR GAS LIGHTING.

At the March meeting of the Philadelphia Section of the American Illuminating Engineering Society a paper was read by Mr. H. R. Sterrett, in which he emphasized the importance of having a specification which will cover the installation of all interior gas piping. The method of handling this phase of the distribution system in one city is described; and the desirability of illuminating engineers deciding on the location of outlets was also discussed. The text of the paper appeared in the "Transactions" of the Society for June.

The author said that, although the Illuminating Engineering Society has primarily to do with the utilization of energy in the form of light, the design of burners and reflectors, the study of the effect of light upon the human eye, the determining of the quality and proper amount of illumination for the great number and variety of conditions under which artificial light is necessarily used, it was the object of his paper to tell something of the means used to convey "that form of light energy commonly known as illuminating gas" to the various outlets or points where it is to be converted by combustion into light or heat.

Broadly speaking, he said, any distribution system may be divided into four component parts—mains, services, meters, and house piping—each of which contributes equally to the satisfactory supply of gas. Of these divisions the first three are under the gas company's control, and hence "are usually properly installed and maintained." He follows with a brief description of a typical low-pressure distribution system.

He proceeds: The importance of a specification which will thoroughly cover the installation of all interior gas piping cannot be too greatly emphasized. In order that such a specification be of any real value, it is very necessary that proper laws be enacted to insure to the gas company the enforcement of the various rules embodied in the specification.

In one large city, before any gas piping may be installed in a building, it is necessary to obtain a permit from the bureau of buildings, which also inspects the work when completed and issues an approval card before a meter may be set; in another city, all piping must be installed in accordance with specifications issued by the gas company, whose inspectors supervise the work; while in still another city all gas-fitters must be licensed and file a plan of the proposed piping with the building department for its approval—the gas company supervising the installation.

In one city where about 375,000 meters are in use, the city government by ordinance requires the gas company to exercise a supervision over the character of material used, and work done, in installing gas piping and fixtures. In accordance with the obligation thus created, the company have adopted a specification for fuel and illuminating piping and fixtures, which includes the kind of material, methods, locations, &c., to be used and avoided in making installations, a schedule of pipe sizes and lengths for various consumptions, instruction how properly to draft a piping plan, and an explanation of just what is required in the way of inspections by the gas company's representatives.

The piping schedule is based on Dr. Pole's well-known formula for the flow of gas through pipes,

$$Q = C\sqrt{\frac{d^5(P_1 - P_2)}{LW}},$$

where Q = cubic feet per hour; d = diameter of pipe in inches P_1 = initial pressure, inches water; P_2 = terminal pressure, inches water; L = length in yards; W = specific gravity of gas (air = 1); C = constant.

A computer designed by William Cox is based on this formula, and saves much time which otherwise would be spent in making calculations. With the computer, the discharge, the required size of pipe, or the difference in pressure can be determined—provided the other two are known.

If the sizes specified in the schedule are checked with the formula, they will be found somewhat in excess of the figures derived from the latter; it being the desire of the gas company to make provision for the future installation of additional appliances without necessitating an increase in the size of piping. The smallest diameter pipe, and therefore the smallest outlet permitted, is ⅜ inch (9·52 mm.); and this, it is assumed, will usually supply 10 cubic feet (0·28 c.m.) per hour at the average pressure. The capacity of a larger outlet, as compared with a ⅜-inch outlet, varies directly as the areas.

In designing a system of piping, after the sizes of the various outlets and the best direction to run the pipes have been determined, it remains to decide the proper size piping to instal. This is accomplished by starting at the part of the system farthest from the meter and working toward the latter—determining the proper sizes by consulting the piping schedule. When the first branch line is reached, the sizes are again determined by starting at the far end of the branch and proceeding to the junction, where the quantities of gas for the two pipes are added and the same process repeated, until finally the meter is reached.

When no outlets are open, the pressure in a system of house piping is uniform, except the small difference due to elevation—each 10 feet (2·54 m.) being equal to about 0·1 inch (2·5 mm.) water column. Just as soon as a burner is lighted, gas begins to flow through the piping; and, as a result of frictional losses, the pressure by the time the gas reaches the burner is reduced. Since it is necessary to have a certain volume of gas at a burner, and since the volume depends on the pressure as well as on the size of piping, a certain pressure loss through a system of piping must be used as a basis, so that in the piping schedule before mentioned a loss of 2-10ths water pressure between the meter and the farthest outlet is considered as maximum. Then, since there is from 25-10ths to 35-10ths (63·5 to 90 mm.) pressure on the mains and services, the pressure at an appliance connected to the extreme outlet would be from 20-10ths to 30-10ths—there being about a 3-10ths drop through the meter.

Due to the fact that there is a certain unavoidable range in pressure over an area as great as that included by the limits of a large city, gas appliances are usually equipped with the necessary means of adjusting the burner to take care of the different pressures.

In one large city, where the gas company is responsible to the city government for all material and workmanship in the installation of house piping, three inspections of interior piping are made—the inspectors being employees of the gas company, impartial, and working for the combined interest of the consumer and the company. When an installation is ready for the first inspection, which is made while the piping is still exposed, a plan of the system or extension, plotted on a regular form, is forwarded to the gas company. The inspector compares the actual installation with the plan, and tests the piping for leaks—a pressure of 3 lbs. (1·36 kg.) per square inch (6·45 sq. cm.), as indicated by a 6-inch (15·24 cm.) mercury column, being applied for ten minutes. If the rules have been complied with, and the system is tight, a certificate of first inspection is issued, and the piping may be covered. If any changes are necessary, they must be made before the certificate is granted. After all carpenter and other building work that might disturb the piping has been finished, and after the last coat of white plaster is on, the gas-fitter applies for the second inspection, which is principally one of pressure, and is made before any fixtures are hung. A pressure test identical with that of the first inspection is made; and if the piping is tight a certificate of second inspection is given. After the fixtures are installed, and the system is ready to receive gas, the third inspection is applied for. This, the last inspection, is principally one of fixtures. The entire system is put under a pressure of 6 inches water column, which must show no drop in ten minutes. Fixtures are examined for poor workmanship, objectionable design, &c., and all gas fixture cocks are carefully measured with a special gauge made for the purpose of determining whether they comply with the fixture cock specification.

There is very little to say about the actual physical house piping. It is simply a case of determining the proper location of, and the approximated consumption of gas for, each outlet—joining the various outlets to the riser; care being exercised so that the piping is of the correct size, properly supported, sloping in the right direction, &c

In ordinary dwelling houses, which form the great majority of cases, a system of house piping usually consists of a riser or pipe running vertically from a point in the basement near the meter, and supplying gas at each floor to a branch pipe, to which are connected the various outlets on that floor. In larger dwellings two or more risers may be run—all being supplied by one meter; while in the case of apartment houses a separate riser and meter supply each apartment. The meters are always installed in the basement, and in some cases (where the number warrants) a special meter-room is built. In modern manufacturing buildings, it is the custom to instal a trunk or common riser—the meter or meters being set on each floor, according to the number of tenants occupying it.

In most cases horizontal gas piping is run parallel with, and under, the floor boards. This not only makes it more convenient if the piping should ever, for any reason, need to be uncovered, but also assures that it will be supported by the joists, which may be notched out as near as is possible to their points of support. Vertical pipes are usually run in hollow partition walls. Whereever possible, it is preferable to have the gas-piping exposed to view. Piping should be laid level; but if not it should be sloped toward an outlet where it can be properly dripped—that is, where any condensation formed might be conveniently drained off.

After a system of piping has been properly installed, it needs very little attention under normal conditions. In time a certain amount of scale may form; and if this collects at any point the arêa will be reduced and the pressure lowered—thus causing a complaint from the consumer that the supply has been insufficient. By shutting-off the gas at the meter, and forcing air through the pipes by means of a hand-pump, these obstructions can usually be removed. The decision as to where each outlet should be placed to afford the proper distribution of light should be made by an illuminating engineer. Of course, there are innumerable little houses where the small rooms, usually square or oblong, do not allow fixtures other than central pendants or side wall-brackets to be installed; and in these cases it is of little importance that the various outlets are located by one who, perhaps, knows little or nothing about lumens, foot-candles, glare, coefficients of reflection, &c. On the other hand, there are thousands of larger residences, apartment houses, commercial buildings, and school houses, where the size of the rooms does not limit the type or location of lighting fixtures. In structures such as these, the location of the light sources should rest with one who is familiar with the principles of illumination.

The writer's attention was recently called to an instance where, in an operation of the better class of dwellings, the living-room was very poorly illuminated—due to the improper location of the outlet. By placing the fixture a few feet to one side, the lighting could have been greatly improved. This is a case where good illumination was evidently sacrificed in order to do away with running the extra pipe extension.

In piping houses for gas, the outlets should be properly located and the piping run to the outlets, instead of, as is the rule in so many cases, locating the outlets according to the easiest and least costly system of piping. If the members of the Illuminating Engineering Society (when the opportunity presents itself) will emphasize this point, better illumination will result in many instances.

The cost of installing a complete, modern system of gas-piping, if put in at the time the building is erected, varies from about one-eighth of 1 per cent. to 1 per cent. of the total cost of the building. These figures are based on the analysis of a great number of cases, ranging from an ordinary residence to large office and commercial buildings.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Importation of Gas-Mantles from Holland.

Sir,—Doubtless the following figures, in this connection, just received from the Statistical Department of H.M. Customs House, will be of interest to your readers:

	1913-14.		1914-15.
October	£544	..	£2,813
November	658	..	3,766
December	493	..	9,395
January	269	..	22,129
February	278	..	14,503
March	312	..	20,458
April	244	..	15,993
May	569	..	23,554
Total for eight months	£3,367	..	£112,611

Eight Months Prior to the War.		Corresponding Eight Months of War.
£3,367	..	£112,611

It will be seen that the present export of mantles from Holland to this country is more than 33 times what it was in the previous year.

We are assured by one of the largest Dutch manufacturers that his output, which, owing to the serious shortage in Holland of coal for gas making and of ramie yarn and also of magnesia mantle-rings, is little more than it was in 1914, represented then upwards of 50 per cent. of the total manufacture of Holland. The English mantle manufacturers are certain that the bulk of these goods are manufactured in Germany and not in Holland; and the best proof of this is the shortage of gas-making coal that exists in that country.

Your readers are probably aware that a mantle consumes in its manufacture from 1 to 3 cubic feet of coal gas; and it is a point for the gas engineers of this country to bear in mind that the import of German mantles through Holland for the eight months (of £108,000, approximately) represents a loss to the gas industry of this country, in sales, of from 20 to 30 million cubic feet of gas.

We make no mention of the loss of business to the British mantle industry, which we think will be obvious to, and deplored by, every patriotic engineer.

The bulk of these German mantles, we might mention, are packed in Holland under the trade marks of the English mantle wholesalers.

For The Volker Lighting Corporation, Ltd.,
C. S. Garland, Works Manager.

Garratt Lane, Wandsworth, S.W.,
June 28, 1915.

◆

Aspects of Co-Partnership.—Letters which recently appeared in our "Correspondence" columns under this heading, are editorally referred to in these terms in the current number of the South Metropolitan Gas Company's "Co-Partnership Journal": "Last month, we commented on a letter sent by Mr. E. O. Guttridge to the 'Journal of Gas Lighting,' attacking the principles of co-partnership. That 'practical business man'—to quote his own description of himself—has written two more letters on the same subject, in which he adheres to his original position with a tenacity worthy of a greater knowledge and a more logical conclusion. He concludes his second letter by relegating theory 'to where all other practical men relegate it,' which is more suggestive than definite. There are at least two kinds of practical man—the 'rule-of-thumb man' and the technically trained man—and the latter takes care to investigate before relegating a theory to anywhere. But Mr. Guttridge throws in a suggestion for improving our present system. He thinks it would be better if 'the workers' share were subject to a fixed minimum.' Now, the worker's fixed minimum is the fixed rate of wages; and he gets that whether the shareholders get any dividend or none. For the shareholder there is no fixed minimum; in very bad times he may have to do without any return on his investment. The co-partnership scheme assumes that a dividend of 4 per cent. per annum is as fair for the shareholder as standard wages rates are for the worker; and when the divisible profits are more than sufficient to pay that very moderate wage to capital, the sharing of profits with the worker comes into operation. To talk about the cost of raw material annihilating the workman's share while the shareholder gets a big dividend is not what one expects from a 'practical business man.' It would not be so astonishing in the speech of a street-corner agitator."

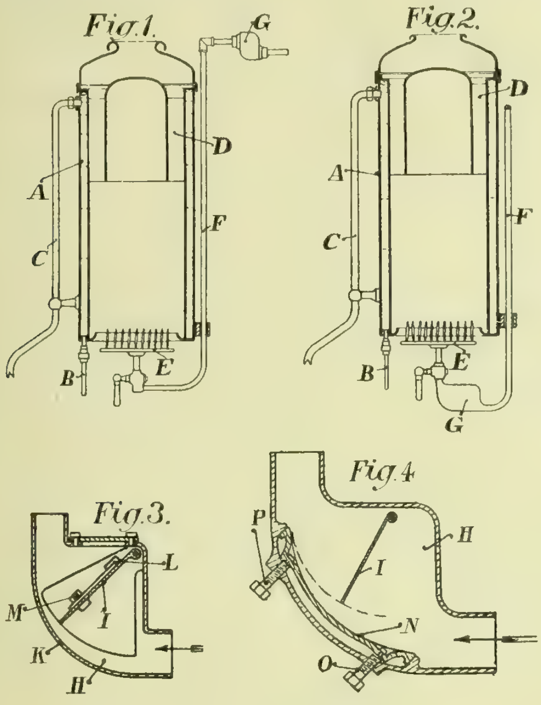
REGISTER OF PATENTS.

Water-Heaters or Geysers.

Junkers, H., of Aachen, Germany.

No. 5438; March 3, 1914. Convention date, March 7, 1913.

This invention has reference to closed geysers heated by gas, so as "to overcome the inconveniences caused by the fluctuations in the gas supply." It consists in the provision of a gas consumption regulator located in the gas supply pipe, as shown in the illustration of two typical forms of the apparatus fitted with the gas-consumption regulators mounted in front of the burner, and also typical forms of the regulator capable of being adjusted in accordance with the nature of the gas being burned.



Junkers' Regulatable Geysers.

Fig. 1 shows an arrangement in which the device for regulating the consumption by the burner is interposed in the gas-pipe leading to the heater. Fig. 2 shows the consumption regulator connected with the heater in order to form a complete unit. [The consumption regulator is not shown in detail, since it is not relevant to the essence of the invention.] Figs. 3 and 4 show a gas consumption regulator which may be adjusted in accordance with the kind of gas and with the local conditions.

In fig. 1, A is the usual vessel for containing the liquid, supplied with cold water through the pipe B; while the hot water issues through the pipe C. A heat exchanging device (of any known kind) is arranged at D; the heater being heated by the burner E, to which gas is supplied through the pipe F. G is a "consumption regulator" (of any kind) arranged in the pipe F.

In fig. 2 the "consumption regulator" is just in front of the vessel containing the liquid—that is to say, is in rigid and permanent connection with it even before the heater is set up, "in order to prevent any error in the exact arrangement of the consumption regulator in mounting the heater."

In place of a gas-consumption regulator acting, in these two instances, only so as to allow the passage of a constant volume of gas under fluctuations of pressure, use may be made, when it is desired to prevent the heater from incrustations of soot—in consequence of a difference in the nature of the gas or as the result of local conditions—of a regulator which is capable of adjustment, typical forms of which are shown in figs. 3 and 4. In fig. 3, the regulation is effected by a throttling flap which is interchangeable, and the component parts of which are adjustable and act in opposition to the pressure of the gas. Here H is a housing in which the throttling flap I is pivotally mounted. According to its position (which is determined by the gas pressure) in relation to the bottom K, the valve regulates the effective aperture, so that when the gas pressure is higher, the flap assumes a more horizontal position. The effective aperture therefore becomes smaller, and *vice versâ*. Consequently an identical volume of gas reaches the burner in all cases. The means by which the regulator can be adjusted in accordance with the varying calorific power of the gases under consideration, consists in this case in the provision of a weight L on the flap I, which weight is capable of being adjusted by the screw M. The adjustment enables the weight component of the flap, acting in opposition to the flow of gas, to be modified in accordance with the nature of the gas and the local conditions. Hence, when the gas has a higher calorific power than the gas for which the regulator was originally adjusted, the weight should be turned in the direction of the flap, so that the flap moves in a zone of narrower cross section than before, and a smaller volume of gas traverses the sectional passage under consideration.

In fig. 4, the means for adjusting the consumption regulator are such that the bottom N can be adjusted by two screws O P. The effect of this adjustment is similar to that described above, in which, as the calorific value increases the sectional area between the flaps I and the adjustable base N is reduced. The two screws O P enable the adjustment to be effected in accordance with the volume of air necessary to the combustion of the gas, or in accordance with the specific gravity, or with the volume consumed.

Quantitative Analysis of Gaseous Mixtures.

Siemens Brothers and Co., Limited; a communication from Siemens and Halske Aktiengesellschaft, of Nonnendamm-bei-Berlin, Germany.

No. 6767; March 17, 1914.

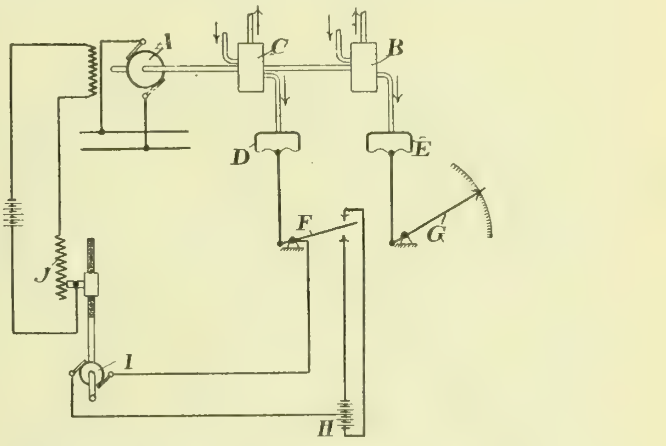
This invention is a modification of the arrangements shown in patent No. 28,943 of 1912, and forms an addition thereto.

It has been proposed, the patentees remark, to determine the density of a gas by measuring the difference of pressure between two points, one near the axis and the other near the circumference of a centrifugal blower, or the like, through which the gas is passed. It has also been proposed to compare the density of a gas with that of a standard gas under similar conditions by a comparison of the readings of the two instruments.

In the main patent specification in which a standard gas is also used, the density of a gaseous mixture is determined by the deflection of a single instrument, the moving parts of which are acted upon by the differences of pressure produced under similar conditions both in the gas to be examined and in the standard gas. It is also pointed out in the main specification that if a gas consists of known constituents, the proportion in which these constituents are present is known when the density is determined, and can consequently be directly indicated by suitable calibration of the instruments, the readings of which are determined by the relation between the density of the standard gas and of the mixture, and are independent of pressure and temperature if both gases are under the same conditions.

In the modification according to the present invention, the relative densities of the mixture and of the standard gas, and hence the proportion in which the constituents are present in the mixture, is directly given by the indications of a single instrument; but the instrument is only exposed to the pressure differences produced in the gaseous mixture—the pressure differences produced in the standard gas being automatically maintained at a constant value independent of changes of temperature and pressure. If the gaseous mixture is always exposed to the same conditions as the standard gas, the readings of the instrument which records the pressure differences set up at two different parts of the rotating gaseous mixture will also be independent of changes of temperature and pressure, and the proportions of the constituents of the mixture will consequently be directly shown on a single scale.

In order to maintain a constant pressure difference in the standard gas, its indicating device moves between two electrical contacts only a small distance apart, so arranged that when one contact is closed by means of the indicator the speed of the motor driving the centrifugal blower is increased, and when the other contact is closed the speed is decreased. In this way, a constant pressure difference is maintained at the manometer of the standard gas; and if care is taken that the other centrifugal blower rotating on the same shaft has the same pressure and temperature as the standard gas, the manometer connected to it will give indications which show directly the proportion present of a given constituent of the gaseous mixture.



Siemens and Halske's Gaseous Mixture Analyzer.

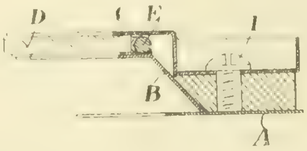
The arrangement employed is shown diagrammatically. On a shaft driven from a motor A are secured a centrifugal device B for the gas to be analyzed, and a similar device C for the standard gas. The gases are led into containers D E, which are closed by membranes below, the movement of which is transmitted to the indicators F G. The former indicator of the manometer for the standard gas plays between two contacts at a small distance apart. H is a battery and I a motor which inserts, by means of a spindle and nut, more or less of the resistance J into the energizing circuit of the motor A. If, for instance, the upper contact is closed by the indicator, the motor I is energized so as to cut out resistance; on closing the lower contact, more resistance is inserted. The speed of the motor A undergoes, in consequence, small fluctuations. The position of the pointer G at the indicating apparatus of the gaseous mixture will only alter according to the relative proportions in which its constituents are present.

Gas-Meters.

Watling, A. E., Commercial Gas Company, Stepney.

No. 13,586; June 4, 1914.

This invention relates to the fitting of the glass plates covering the indicating mechanism of gas-meters, and comprises improvements whereby a fractured glass can be readily replaced without it being necessary to unsolder the frame of the meter to get at the glass.



Watling's Meter Index Arrangement.

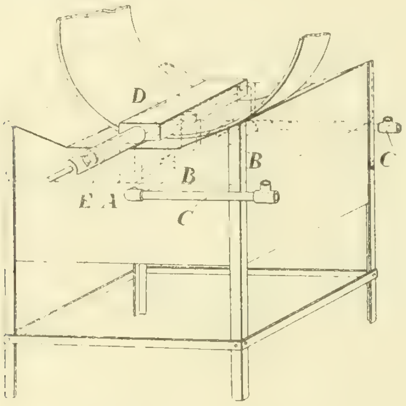
A indicates the usual gallery surmounting the meter proper, which carries the recording and indicating mechanism; the latter being covered by a glass plate D mounted within a frame B soldered to the gallery. According to the patentee's proposal, the glass plate is inserted into the frame from the front; the frame being provided with an inturned rabbet (to receive the glass) formed by turning in the metal of the frame and soldering a bead or wire E on it. The glass is bedded on putty and the cover which fits over the frame B is secured by screws I passing into tapped holes in small blocks soldered to the gallery, and which can be covered with sealing-wax and sealed. Should the glass be broken, it can be easily replaced by removing the sealing-wax, loosening the screws I, and taking off the cover.

Welding Furnaces.

TWIGG, W. R., of Luton.

No. 20,138; Sept. 24, 1914.

This invention relates more particularly to furnaces for welding joints in cylindrical articles which can be subjected at the point of weld to flames arranged to play on both the inner and outer surfaces. The furnace is provided with a readily movable and independent heater having a groove in which the flame from an attached burner can play, so as to concentrate the flame of the heater upon the inner side of the article being welded.



Twigg's Gas-Welding Furnace.

The perspective view of the furnace in use shows the hearth formed of fire-clay or other refractory material contained within a sheet-iron casing rectangular in plan. The upper surface of the hearth is formed with two angular cheeks which slope downwards and inwards from the upper edges of two opposite sides to a flat area. The furnace hearth thus offers a surface of convenient shape for such objects as a curved plate, as it prevents them from rolling while being operated upon.

Parallel with the angular cheeks, and midway between them, a slot, closed at each end by walls A and divided, if required, by a partition, is formed in the flat area of the hearth, in which bunsen burners B, of flattened cross section, are arranged with their mouths a short distance below the level of the hearth. These burners are fed from pipes C connected to any suitable source of supply outside the hearth.

For heating the joint being welded on the inner (or upper) side, an independent heater D is employed. This (also rectangular in plan) is composed of fire-clay material encased in sheet iron. A bunsen burner tube E leads into a cavity formed in the underside of the heater, and which is open at the end remote from the end where the burner enters. The burner of the heater is connected by a flexible tube to the gas supply.

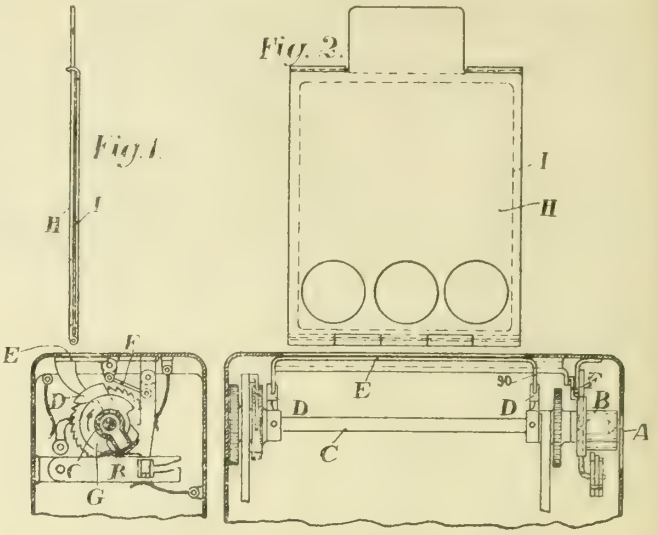
In operation the burners B are first lighted and the article to be operated upon is placed in position on the upper surface of the hearth—the joint to be welded being arranged directly over the flame. The burner E of the heater D is then lighted; the flame being applied to the inner or upper side of the joint.

Record Printing and Registering Apparatus for Meters.

KOLÁR, N., of Budapest, Hungary.

No. 19,251; Aug. 25, 1913. Convention date, Aug. 26, 1912.

This is an improvement on patent No. 25,959 of 1912, which described apparatus for recording and printing mechanism for gas-meters, by merely inserting an account form into it and actuating the printing mechanism by turning a key. The improvements relate to means for inserting the account form to be printed and to safety devices for preventing misuse of the apparatus.



Kolár's Meter Consumption Registering Apparatus.

Figs. 1 and 2 are side and front views of the frame serving for the insertion of the account form. Fig. 3 shows, in section, sufficient of the apparatus to make clear the safety device serving to prevent misuse. Fig. 4 is a front view of the safety device.

The mode of operation is as follows: The position of rest of the various parts is as shown in fig. 3. The key, after insertion through the key hole A into the sleeve B, can be turned in the direction of the arrow, carrying with it the sleeve and spindle C. During this movement the wards of the key operate on portions of the lock until the key cannot be turned farther. At this moment the segments D have been turned sufficiently far to release the noses on the flap E. Pressure is now applied to the flap by means of the frame, holding the account form so as to open the flap, and also by means of the connecting rod F to press a pawl back and release the disc G. The frame H I can now be pushed into the apparatus; and the spindle C is rotated further by means of the key and the printing of the account accomplished.

Should a false key be inserted, the holding levers would not take up such a position as to permit of the yielding of the pawl, so that neither could the flap E be depressed nor the disc G released. The key could not therefore be turned further round, and the backward turning of the key is prevented by the ratchet wheel. As the key has been already turned so far that the wards are no longer opposite the key hole A, the key cannot be removed, and is held fast in the apparatus, so that it would "lead to the identification of the operator."

The coupling of the counting trains of the printing device with the counting train of the meter is performed preferably by a flexible shaft inserted through a boring made at the casing of the meter and coupled with the indicating drum of the counting train of the meter.

APPLICATIONS FOR LETTERS PATENT.

9058.—STEWART, A. W., "Pipe-joint." June 21.

9067.—LEA, J. E., "Measuring the flow of gases." June 21.

9072.—VALENTINE, H. S., "Supports for gas-fires." June 21.

9104.—LUCAS, O. D., "Distilling coal, &c." June 21.

9152.—HALL, W. A., "Distilling coal." June 22.

9155.—STEENBERGH, B. VAN, "Manufacturing carburetted hydrogen gas." June 22.

9156.—THOMAS, W., "Revolvable retorts." June 22.

9162.—RITTMAN, W. F., "Manufacture of light hydrocarbons." June 22.

9163.—RITTMAN, W. F., "Manufacture of benzene, toluene, &c." June 22.

9214.—DRAKES LIMITED, and DRAKE, W. A., "Regenerative furnaces." June 23.

9296.—TROQUAY, J., "Controlling gas-valves." June 24.

9341.—GEE, J. E., "Regulating temperature in closed chambers." June 25.

9369.—AIRD, K., "Burners for gas-fires." June 26.

9375.—PRIOLEAU, J. R. H. & W. L. ST. J., "Obtaining the volatile gases distilled from carbonaceous material." June 26.

Public Lighting Allowance at Cheshunt.—In a letter of reply to the Cheshunt Urban District Council, Mr. W. B. Randall, the Engineer and Secretary of the Waltham Abbey and Cheshunt Gas Company, wrote that his Directors considered that their offer of an allowance of 6d. per 1000 cubic feet of gas not used for public lighting was a liberal one; but in order to try and meet the views of the Council, they were prepared to agree, without prejudice, to an addition of 3d. per 1000 cubic feet, making a total allowance of 9d. The letter continued: "They further desire me to point out that since the date of the first offer of a rebate the price of coal and other raw materials, and labour, has considerably advanced. The Directors are still anxious to avoid increasing the price of gas to ordinary consumers; but they have had to reduce their dividend on all classes of shares 1 per cent. from July 1 last year." The Works Committee unanimously recommended that the offer of the Company should be accepted, but without prejudice to the rights of the Council in the event of any legal decision being hereafter made with reference to contracts for public lighting entered into by local authorities which have been varied by orders of Government authorities under the Defence of the Realm or other Acts. The recommendation was agreed to.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills :—

Bill brought from the Commons, read the first time, and referred to the Examiners : Gas and Water Provisional Orders (No. 2).

Bill read a second time and committed : Gas and Water Provisional Orders (No. 1).

Bills read the third time and passed : Chelmsford Corporation Gas, Lurgan Urban District Council.

Bills Royal Assented : Altrincham Gas, Ammanford Gas, Warwick Gas.

The Weardale and Consett Water Bill has been referred to a Select Committee, consisting of M. Bristol (Chairman), E. Craven, V. Falkland, L. Annaly, and L. Aberdare ; to meet to-day.

HOUSE OF COMMONS.

The following further progress has been made with Bills :—

Bills reported : Northwich Gas [Lords], Sutton District Water [Lords].

Bills considered : Prescot Gas [Lords], Spennymoor and Tudhoe Gas [Lords].

Bills read a second time : Kilmarnock Gas Order [Lords], Plymouth Corporation.

Bills read the third time and passed : Altrincham Gas [Lords], Gas and Water Provisional Orders (No. 2), Warwick Gas.

A petition has been deposited by Francis Monckton and Walter T. C. Giffard against the South Staffordshire Water Bill [Lords].

The Cheshire Lines Committee have withdrawn their petition against the Northwich Gas Bill, which (being unopposed) has now been referred to the Committee on Unopposed Bills.

Coal Supply

In the House of Commons on Monday of last week,

Mr. Neville asked the President of the Board of Trade whether he could state the average number of days per week worked by collieries in the month of May, as compared with the average number of days worked by coal miners at such collieries during the same period.

Mr. Runciman (the President of the Board of Trade) said that the average number of days per week on which coal was hewn and wound at collieries in the United Kingdom in May last was 5·64. The Board had no information as to the average number of days worked by the miners in the same period ; but some particulars on the subject for an earlier period would be found in the report of the Coal Mining Organization Committee, recently published.

Mr. Anderson asked the President of the Board of Trade if he was in a position to announce his policy as to limiting the price of coal ; and whether he was aware that the coal companies were now making their contracts at increased rates for twelve months ahead, so that action, unless immediate, would be ineffective.

Mr. Duncan Millar asked the President of the Board of Trade whether he could now state what steps he proposed to take to carry out the recommendations of the Committee appointed to deal with the question of the retail price of coal ; and whether, having regard to the representations received by him from many members and others, and to the failure on the part of the coalowners to come to a proper arrangement, he would now fix the price of coal for home consumption throughout the United Kingdom.

Mr. Runciman, in reply, stated that several of the recommendations had already been adopted. He hoped to be able to make a further announcement on the subject shortly.

War Badges for Employees.

Mr. Touche asked the Under-Secretary of State for War if he was aware that the Manager of the Heston and Isleworth Electricity Works, in response to an application for war badges for certain skilled employees on his staff, containing the names of firms engaged on Government work to which power was being supplied by his works, was informed that the issue of official badges could not be authorized, on the ground that no power was being supplied to any factory manufacturing munitions of war ; that his application was made as the result of a communication from the War Office to the Secretary of the Associated Municipal Electrical Engineers (Greater London), in which it was stated that a system had been instituted by which badges for skilled employees of suitable age and willing to enlist if called upon to do so could be obtained on application to the War Office ; and that the application of this system was suggested by the military authorities to the Associated Municipal Electrical Engineers as a means of retaining their skilled employees. Was he aware that the attitude of the War Office towards the application for badges did not seem to accord with the official statement to the effect that several electrical companies had been offered such badges for issue to men of recruitable age who would be willing to enlist in the event of emergency ; and would he say why there was this inequality of treatment in regard to the issue of badges to skilled employees of electrical services ? If it represented a change of attitude, would he consider the advisability of its modification, with a view to granting badges to the skilled employees of the Heston and Isleworth electricity works, and to the employees of other companies similarly situated.

Mr. H. W. Forster, in reply, said : There has as yet been no change in the procedure as regards the issue of badges to employees at electric power stations. The position is as stated in the first part of the question ; but the power stations must be supplying power for the manufacture of munitions.

NOTTINGHAM GAS RESERVES.

After exhaustive inquiry, the Nottingham Corporation succeeded last week in securing, with unimportant modifications, the confirmation by the House of Lords Committee of the measure, which had passed its earlier stages in the Commons, for spending large sums upon improving the navigation of the Trent between Nottingham and Newark and acquiring certain statutory rights of the Trent Navigation Company. One important part of the measure, which the Lords Committee have now reported for third reading, is the power which it gives to draw upon the gas reserves and other funds of the municipal trading undertakings, in carrying out the scheme.

NORTHWICH GAS BILL.

The Unopposed Bills Committee of the House of Commons last Thursday sent this Bill forward for third reading. The measure has already been passed by the House of Lords [see "Journal," April 20, p. 155].

Mr. Lees (Messrs. Lees and Co., Parliamentary Agents) explained the modifications which have been made in the Bill since it was first deposited. These were given in detail in our columns on the previous occasion. Briefly, it may be stated that, as a result of negotiations with the Urban District Council, a proposal to convert the Company from a maximum price company to a sliding scale one has been withdrawn, as also has the proposal to acquire a new site for the gas-works. The calorific value testing clauses have been amended, and now contain the standard of 500 B.Th.U., with no margin. The main objects of the Bill now, therefore, are to raise £45,000 of additional capital, and to convert the existing shares of the Company (except the preference) into uniform 6 per cent. stock. This figure has had to be adopted, as it has been realized that it will be impossible in future to raise new capital at par on the basis of 5 per cent.

For some days the Bill was in the list of Opposed Bills, to be heard by Sir Edwin Cornwall's Committee in connection with a petition by the Cheshire Lines Committee ; but this was subsequently withdrawn.

SUTTON AND DISTRICT WATER BILL.

This Bill was last Thursday sent forward for third reading by the Unopposed Bills Committee of the House of Commons. It has already passed the House of Lords [see "Journal," April 20, p. 156], when the facts were set out.

SOUTH STAFFORDSHIRE WATER BILL.

Consideration of the Bill promoted by the South Staffordshire Water Company was commenced last Tuesday, by a Committee of the House of Commons presided over by Sir Edwin Cornwall. The Bill has already passed the House of Lords. [See report in the "Journal" for May 4, p. 286.]

Mr. J. D. Fitzgerald, K C., Mr. Clode, K.C., and Mr. Cave appeared for the promoters. The only opponents were a combination of local authorities, represented by Mr. Tyldesley Jones. The Local Authorities concerned are Dudley, Smethwick, Walsall, Sutton Coldfield, Wednesbury, Brierley Hill, Cannock, Sedgeley, and Halesowen.

Mr. Clode, in presenting the Bill to the Committee, outlined the main features which were given in our columns at the time the House of Lords Committee considered it. The opposition is not concerned with the general scheme of the Bill, but with a number of details. The most important one is in relation to clause 32, which deals with the method of raising capital. The clause is as follows :—

(1) Notwithstanding anything contained in the South Staffordshire Water-Works Acts and Order 1853-1913 or in Part 2 of the Companies Clauses Act, 1863, all stock created under the powers of the section of this Act of which the marginal note is "Power to Raise Additional Capital," and of ordinary or preference stock hereafter created or disposed of under the powers of the Order of 1901 or Act of 1909, may, subject as hereinafter in this section provided, be disposed of at such times and to such persons and on such terms and conditions and in such manner as the Directors think advantageous to the Company.

(2) Such stock shall be in the first place offered to the public.

(3) Such stock shall not be disposed of at a price below the price which may be from time to time fixed as the best price at which the same, in his opinion, can reasonably be disposed of by the Company, by the President of the Birmingham Stock Exchange, or some person nominated by him.

(4) A copy of any prospectus offering the stock for sale shall be filed with the Board of Trade as soon as reasonably practicable after the issue thereof.

(5) The Company shall, so soon as practicable after the expiration of each year ending the 31st day of December, send to the Board of Trade particulars of stock created and issued by the Company during such year, and such particulars shall state the total amount of stock sold during that year, and the price obtained for the same and the manner in which the same was issued.

Continuing, Mr. Clode admitted that this was a departure from the usual auction clauses in Gas and Water Bills ; but, under Standing Order No. 188 of the House of Commons, it was open to a Committee to vary a model clause, and they were then bound to report to the House their reasons for such modification. The matter had been discussed in the House of Lords; but there the promoters did not have to run-counter to any Standing Order, because the auction clause in the House of Lords only applied to Gas Bills and not to Water Bills. The reason for the alteration in this case was that, under the auction clauses, it was frequently found difficult for a company to sell stock, as the reserve price which had to be fixed was not known, and people refused to buy a "pig-in-a-poke." Consequently stock was frequently put up to auction; and if it was not sold then, it could be offered to ordinary shareholders. These, it had been found by actual experience, refused naturally enough, owing to the knowledge that the shares had not been taken up well at the auction. Then the company were bound to put the stock up to auction again; but it would only fail, and finally it meant that the Directors could deal with the stock in the manner they thought best.

The Chairman remarked that this was a general objection to the clause.

Mr. Clode agreed, but said that he could show how the objection applied to this Company particularly. Only those people intimately acquainted with the affairs of a company knew the reserve price; and consequently it was not difficult in that case to sell the stock. In a large Company such as this, however, which appealed to a larger clientele, there was not sufficient information among the people whom it was desired to attract as to the affairs of the Company, and the difficulties he had mentioned occurred. The Company had tried the effect of the auction clauses, and found them a complete failure. There was no sinister design in the altered clause for getting the shares into the hands of the existing shareholders—in fact, it was expressly laid down that the shares must in the first case be offered to the public; and it was confidently believed clause 32 would ensure a better price than could be obtained under the auction clauses.

The Chairman remarked that there was no provision for advertising stock as in the auction clause.

Mr. Clode thanked the Chairman for this criticism. It had missed the attention of those who had carefully considered the matter, including the authorities of the other House; but he certainly thought that it would improve the clause. Some objection, he believed, would also be taken to clause 33, which allowed for underwriting; but no large sum of money could be obtained without underwriting. As to precedents for the modification of the auction clauses, he mentioned the following Bills: Barry and Cadoxton Gas and Water (1889), Bognor Water (1891), Filey District Water (1891), Rhyl District Water (1892), Bexhill Water and Gas (1892), Bridlington Water (1895), York Water (1895), Harpenden Water Order (1899), Rickmansworth and Uxbridge Valley Water (1900). Another clause to which exception was taken was clause 44, providing that the Company and the local authorities could come to agreements whereby the authorities could give the Company a guaranteed revenue for bringing water into a district. He failed to see why this should be objected to, as the Bill already contained the Model Clauses with regard to property owners' guarantees—namely, a revenue equal to 10 per cent. on the cost of the main for three years. Cases, however, arose where a local authority might desire the Company to take water to a district which was just developing, and clause 44 left it to the Company and the local authority to make arrangements whereby the latter could give a guaranteed sum for getting the water. At present a local authority could not do this under the general law. It was suggested by the opponents that any such guarantee should only be 5 per cent. of the cost of the main. He believed that the only other point of objection was in regard to clause 45, which authorized a charge of 20s. per annum where a hose pipe was used for watering gardens or washing carriages and motor-cars. There were many cases of this nature in various Acts; but the amount ranged from 10s. to 20s. It was felt in this case that 20s. was a reasonable figure.

Evidence having been heard in support of Counsel's statement,

Mr. Tyldesley Jones, addressing the Committee on behalf of the opponents, submitted that no case had been made out for varying the terms of the auction clause in this instance. The chief arguments seemed to be against the absence of knowledge of the minimum price on the part of probable purchasers of the stock. But there was nothing in the auction clause to prohibit a minimum price being published, although equally he agreed there was nothing in the clause which said that the Company should publish the minimum price. All the precedents mentioned by Mr. Clode related to new companies or struggling companies, who conceivably would have difficulty in raising capital under the auction clauses; but this remark could not apply to the South Staffordshire Company, inasmuch as their shares were quoted on the Birmingham Stock Exchange, and anyone desirous of tendering could easily find out the position of the Company and get some idea of the price at which he would have to tender in order to obtain the stock. If by some addition to the auction clause it could be made clear that the Company could publish the minimum price, the whole difficulty would be cleared away. As regards the question of guarantees by local authorities, he submitted that 5 per cent. for ten years was more favourable to the Company than 10 per cent. for three years. Moreover, several agreements on this basis had actually been entered into by the Company with a number of local authorities. The question of the hose pipe affected the rateable value of the premises. At present all consumers were charged on the rateable value basis; and where a garage or coach-house was attached, the rateable value upon which the water-rate was based included the rateable value of the coach-house. By wishing to make an additional charge, the Company were endeavouring to get the water used in the coach-house or garage paid for twice over. In these circumstances, 10s. seemed to him to be a reasonable figure.

The Committee, in passing the preamble of the Bill, decided that the auction clauses would have to be inserted with some provision to enable the Company to indicate the minimum price. As to the guarantee by local authorities, this clause would be left merely as an enabling clause. But the terms of the guarantee applicable to owners of property—namely, 10 per cent. on the cost of the main for three years—would be inserted. As to the hose pipe, the Committee thought a charge of 20s. per annum was reasonable.

MISCELLANEOUS NEWS.

THE INSPECTION OF GAS-LIQUOR AND OTHER WORKS UNDER THE ALKALI ACT.

Reports of District Inspectors.

The recently-issued annual report of the Chief Inspector under the Alkali Works Regulation Act, 1906 (Mr. W. S. Curphey), was noticed in the last issue of the "Journal," and opportunity may now be taken of dealing similarly with the reports of the District Inspectors.

Work in Ireland.

The first report is by Dr. T. Lewis Bailey, the Inspector for Ireland, where the number of works registered during 1914 showed an increase of four over those registered in the previous year, and there was an increase of four in the number of processes under inspection. There are 67 works registered, in which 90 processes are carried on. Of the 182 visits paid and 133 tests made during the past year, 12 visits and 13 tests were made by Mr. E. G. Ballard, who retired in the early part of the year, and 43 visits and 38 tests were made by Mr. Harold J. Bailey. There has been nothing calling for very serious criticism in any of the works. There have been a few minor troubles; but, on the whole, the works have been carefully conducted, and necessary repairs have been attended to in all cases. As to sulphate of ammonia and gas liquor works, it is remarked that most of the plants are small and are at gas-works. Three new works were added during the year. The quantity of ammonium salts produced during the year showed an increase of 8½ per cent. At one works liquor ammoniæ is produced. The direct method of production has been adopted at one works. The proportion of liquor distilled by the continuous process was 98·2 per cent.; and of liquor distilled by the intermittent process, 1·8 per cent. The proportion of sulphuretted hydrogen treated by various methods, in terms of sulphate made, per cent. of total make, was: By oxide of iron, 87·7; by burning, 0·7; precipitated by metallic salts, 11·6.

North of England.

In the North of England district, Mr. E. Morley Fletcher reports that the number of works registered during the year was 165. There are 225 separate processes under inspection—an addition of one over the previous year. There were 641 visits paid to registered works in the district during the year, and 583 quantitative tests were made of the gases leaving the various processes.

Three new works were registered for the manufacture of sulphate of ammonia during the year. Two were in connection with the recovery of bye-products from coke-ovens, the other was a gas-works. Here operations had been carried on for some years in ignorance of the requirements of the Act; and this plea was accepted on payment of back-fees.

The direct recovery of ammonia as applied to gas-works continues to give satisfaction at the one works in the district where this method is in use. The chief feature of the year is the supplying of Middlesbrough with coke-oven gas from a bye-product coke-oven works.

The following statement gives particulars regarding the methods of utilizing gas-works liquor and the means employed for dealing with the noxious gases evolved: Proportion per cent. of sulphate of ammonia made by continuous processes, 99·6; proportion of the sulphuretted hydrogen treated by the various methods of disposal in such works in terms of the sulphate equivalent of the liquor distilled: By Claus process, 48; by oxide purification, 52.

Cheshire, North Wales, and Part of Lancashire.

This district is, in addition to Ireland, under the care of Dr. Bailey. During the past year there has been an increase of three in the number of works registered, and of five in the number of processes under inspection. There were 498 visits made in the district and 582 tests. There are 94 works registered, and 152 separate processes of manufacture. The works generally have been well conducted.

The gas liquor works have been frequently inspected, and the absorption of sulphuretted hydrogen has invariably proved satisfactory. At the sulphate and muriate of ammonia works all continues satisfactory. In the manufacture of sulphate of ammonia from gas liquor all plants use the continuous process. The proportion of sulphuretted hydrogen treated by the various processes, in terms of sulphate of ammonia made, per cent. of total liquor distilled, is as follows: By Claus process, 7·5; absorbed in oxide of iron, 42·8; precipitated by metallic salts, 49·7.

There is an increase of one in the number of registrations of tar-works. It has been necessary to call attention on very few occasions to minor details; but beyond this there is no cause for adverse comment. One plant was found working without registration.

Widnes, Runcorn, and Liverpool.

Mr. Herbert Porter has charge of the district comprising Widnes, Runcorn, and Liverpool; and he reports that the number of registered works in this area during the year was 41, with 102 separate processes of manufacture. The number of visits paid was 517, and 765 tests were made. There was considerable activity in this district in extending existing processes and in the erection of plant for new ones owing to the war, in addition to which new works are being erected. Owing to the shortage of labour, some difficulty has been experienced in working and maintaining various chemical plant in the desired state of efficiency, in face of the increased demands upon the trade during the last two months of the year.

The different methods of treating sulphuretted hydrogen evolved from gas-works liquor are shown in terms of sulphate of ammonia per cent. of total make: Absorbed by lime or oxide of iron, 17·1; by combustion, 7·3; by other methods (including absorption in ammoniacal liquor), 75·6. All this class of plant has been properly worked during the year.

There are eight tar-works in the district. Large stills seem, it is remarked, to be the order of the day; and attention is being paid to improved methods of firing them. All the plant was properly worked during the year.

NORTH AND EAST LANCASHIRE, AND PART OF YORKSHIRE.

The number of works registered in the area embracing North and East Lancashire and part of Yorkshire is 126, and of processes 239. Mr. H. J. Bailey reports that the chemical-works in this district were adversely affected during the spring and early summer, owing to the uncertain state of the cotton trade; but after the first few weeks of the war considerably increased activity resulted in many departments, and the shortage of sulphuric acid, due to greatly increased demands, became quite a serious trouble to some manufacturers towards the end of the year. Labour difficulties have also been great during the closing months of the year, due to so many process men having enlisted, and time being required to train new employees in their duties. However, in spite of the great difficulties of the situation in these early months of the war, it is, he says, gratifying to be able to state that no serious grounds for criticism have arisen.

There were 59 works registered under the heading of Gas Liquor and Sulphate and Muriate of Ammonia, in which the separate processes were: Sulphate and muriate of ammonia 54, gas liquor 11. The proportion of ammonia distilled by the continuous process was 97·1 per cent. of the total. The methods of disposal of the foul gases produced in the distillation of gas-works liquor for the production of sulphate of ammonia were as follows (proportion of sulphuretted hydrogen dealt with in terms of sulphate produced): To vitriol chambers, 30·7 per cent.; by Claus process, 10·8; by oxide purifiers, 46·3; by combustion, 12·2. One works at which the vitriol chambers were destroyed by fire resorted to the temporary expedient of destroying the foul gases by combustion. The average of tests taken at the chimney to which these gases were conducted was 0·88 grain as sulphur trioxide per cubic foot. Ammonia liquor produced at coke-oven plants has been distilled at five works. At two of these concentrated liquor only is produced, at two the Claus kiln deals with the foul gases, and at one works the foul gases were destroyed by combustion. The average total acidity of the chimney gases in the latter case was 0·80 grain per cubic foot, expressed in terms of sulphur trioxide; and no free sulphuretted hydrogen was found. At these works a new sulphate plant has come into operation, and considerably relieved the pressure of work—thus enabling proper repairs to be made from time to time. These works have all been carried on during the past year with freedom from accident or cause of complaint.

There are 26 tar-works registered. No ground for criticism arose in connection with this class of works, except in one case, where the foul-gas pipes from the worm-end had been disconnected from the fire. It was found to be a case of neglect of workmen who had been effecting repairs, and was speedily rectified on the manager's attention being drawn to the defect.

EAST MIDLAND.

Mr. Robert D. Littlefield reports that the number of registered works in this district at the end of the year was 151; the total number of processes scheduled for inspection being 243. During the year a total of 681 visits and 777 chemical tests were made.

The proportion of gas liquor distilled by the continuous process amounted to 99·6 per cent. of the total. The proportion of the sulphuretted hydrogen treated by the separate methods in such works in terms of the sulphate of ammonia equivalent of the liquor distilled was: To vitriol chambers, 33·8 per cent.; by Claus process, 24·3; by oxide purification, 41·9. The average total acidity of the chimney gases at those coke-oven works in which, on account of the working conditions, the combustion method is accepted as the best practicable means of disposal of the sulphuretted hydrogen, was equivalent to 0·79 grain of sulphuric anhydride per cubic foot. This figure compares with 0·9 grain for the previous year.

The following figures relating to the total output of ammonia compounds in this district during 1914 are, says Mr. Littlefield, interesting. Using the sulphate of ammonia equivalent as the basis of the calculation, there is a decrease of 1·4 per cent. compared with that produced in 1913. Separating the amount of sulphate made under headings "ordinary gas-works" and "coke-oven works," there is a decrease of 3·7 per cent. in the former, and an increase of 2 per cent. in the latter. The total output on the basis of the sulphate of ammonia equivalent is proportioned as follows:—

	1914.		1913.
Gas-works	38·15 per cent.	..	39·1 per cent.
Carbonizing works . .	1·26 ,,	..	1·5 ,,
Coke-ovens	58·34 ,,	..	56·3 ,,
Producer gas. . . .	2·25 ,,	..	1·5 ,,

SOUTH MIDLAND AND NORFOLK.

Dealing with this district, Mr. Edward Jackson states that during the past year there has been an increase of twelve in the number of works registered, and of nineteen in the number of processes under inspection. There were 692 visits paid—every works in the district being inspected and reported upon.

There are 123 works registered in the district where sulphate, chloride, or carbonate of ammonia is manufactured or gas liquor concentrated. At 116 works sulphate of ammonia is produced, at 6 chloride of ammonia, while at 13 other works gas liquor is concentrated. There are, therefore, 135 plants under inspection where ammonia compounds are manufactured.

Ten new sulphate of ammonia plants have been registered this year. Five are at ordinary gas-works. Three of these are for the usual liquor distillation process, and are supplied with ample condensers; and in each case there are two oxide-heap purifiers supplied with hydraulic change valves. The other two gas-works plants are for the direct sulphate of ammonia process. Two of the other new plants are attached to coke-ovens, and both are designed to produce sulphate of ammonia by the direct process. The remaining three plants are producer-gas plants. One new small gas-liquor plant, for making purified ammonia, has been erected, in addition to the above.

The direct sulphate of ammonia process for ordinary gas-works continues to make progress. There are five such plants now in the district; and they appear to give every satisfaction, and the salt produced is a good colour. The recently-erected sulphate of ammonia plants at coke-ovens have also been of the direct-recovery type. There are 25 bye-product coke-oven plants now working in the district; eight producer-gas plants of the Mond type, and one of a smaller character; also two iron-works recovering ammonia from blast-furnace gases. The remaining plants are for the ordinary gas-liquor distillation method, and are of very much the same principle, producing sulphate of ammonia, or for gas-liquor concentration only.

There has been a further increase of seven tar-works registered this year, bringing the total number of works in the district where tar is distilled up to 55. At three of the new works which have been put into operation this year, "prepared tar" for road treatment only is produced. In each case the foul gases from the closed receivers attached to the condensers are arrested in small lime purifiers. At two of the other works the tar-stills are attached to coke-oven plants; and the remaining two tar-plants are in connection with large "power-gas" plants. In all these works the uncondensed vapours from the distilling operation are sent into a fire. Pitch-coolers with suitable provisions for compliance with Act requirements have been attached. The works previously registered have been carried on as usual. In some cases, further improvements have been effected to more completely prevent nuisance arising from both uncondensed vapours from the stills as well as from the pitch-coolers

SOUTH AND SOUTH-WEST OF ENGLAND.

In his report on the South and South-West of England district, Dr. Alfred C. Fryer states that the total number of registered works was 180, and of processes inspected 250—an increase of eight works and eleven processes since 1913. The total number of visits of inspection to registrable works was 718, and of tests taken 562.

The number of works where ammonium sulphate or ammonium chloride is manufactured has now risen to 110. Of the four works which have reconstructed their plants, two are on the continuous system, and two on the direct method of sulphate manufacture; and it is, says Dr. Fryer, interesting to record that the five new registrations are all on the latter method. In one case the new plant is at a gas-works situated on the banks of the Thames; and it is so arranged that no effluents are allowed to escape either into the river or into the town sewer. This method must prevent a considerable loss of ammonia from storage-tanks for gas liquor; for in some works there is no difficulty in detecting the loss by the nose. As the tendency is now to get nearer 30 lbs. of sulphate of ammonia per ton of coal carbonized, it is needful to observe every known economy; and for this reason it is a wise precaution to work up gas liquor as soon as possible after it has been made when the direct process is not in use, for ammoniacal liquor is most difficult to store without loss. In addition, there should be a saving of lime in the still, as the proportion of "fixed" ammonia would be less. It is also well to carry the gas-liquor pipe to the bottom of the storage tank, to prevent the splashing and agitation of the liquor; while in some cases a light film of oil is laid on the stock of liquor to prevent the loss of ammonia. Paraffin has been tried; but as it possesses a tendency to evaporate, a less volatile oil has been preferred.

The importance of the conservation of ammonia has, he adds, been forcibly brought home to gas engineers during the last few years. A paper dealing with this matter was read by Mr. Ernest H. Clarry in May, 1914, before the Wales and Monmouthshire District Institution of Gas Engineers,* embodying results obtained by a new scrubbing plant which had recently been put into operation at Cardiff. The objective in using the new plant was the quick removal of the thick tar from the gas prior to condensation; easy and efficient condensation to retain the greatest quantity of the calorific and candle-power constituents; entire removal of even the lighter tars before washing; the formation of a strong ammoniacal liquor; lessened exposure of ammoniacal liquor to the atmosphere and reduced pumping; and the retention of all available ammonia absorbed by the water.

"Hurdle" grids have been used in one or two of the oxide of iron purifiers for sulphate plants in this district; and the managers of these works are now able to express some opinion upon them. Two things, Dr. Fryer remarks, seem noticeable—viz., as there are a large number of vertical pieces of wood in the purifiers, the gas has a tendency to ascend upwards and alongside such uprights; and the difficulty of removal of the spent oxide for revivification is considerable when the hurdle grids have to be dug out of a comparatively hard material. Consequently, the wear and tear is apparently more than with the ordinary grids.

The yellow colour noticed occasionally in sulphate of ammonia is due to the arsenic in the acid being precipitated by the sulphuretted hydrogen evolved in the process as arsenious sulphide. Some experiments have been made this year with the acid when this characteristic yellow colour was produced; and it was found that if it contained about 0·01 per cent. of arsenic, a very slight colour was given to the sulphate, while 0·03 per cent. gave a strong colour. It was also noticed that if the acid contained traces of copper as well as arsenic, there was a tendency to form a grey-brown salt; and when larger quantities of copper were present the salt became a dark grey. In one instance the acid did not contain more than 0·02 per cent. of arsenic; but the scum on the saturator had such a yellowish-brown shade that it was examined, and as much as 25·5 per cent. of cadmium sulphide was found in it.

The following statement shows, in terms of sulphate of ammonia made per cent. of total make, the methods in use during the past year for the treatment of sulphuretted hydrogen in the different works where sulphate of ammonia is manufactured from gas-works liquor, together with the proportion of gas so treated: By oxide of iron purification, 70·4 per cent.; by the Claus process, 15; by neutralization after combustion, 6·2; by hydraulic main, 8·4.

SOUTH WALES AND MONMOUTHSHIRE.

Dr. Fryer also reports upon the South Wales and Monmouthshire district, where the total number of registered works was 125, and of processes inspected 164. The total number of visits of inspection to registrable works was 625.

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* See "JOURNAL," Vol. CXXVI., p. 951.

Although two coke-oven bye-product plants are worked on the direct methods of sulphate of ammonia, yet up to the present no such installation is employed at any of the gas-works in South Wales where the gas liquor is run to waste. This form of plant is being considerably extended at gas-works in the South of England, where the manufacture of sulphate of ammonia is considered a source of profit. A similar method would, it is pointed out, be equally beneficial to those smaller gas undertakings in South Wales, where the gas liquor is neither worked up into sulphate nor sold.

As long ago as 1897, Dr. Fryer met some of the colliery owners at the offices of the Thursis Copper-Works, Cardiff, and they discussed together the problem of the recovery of the bye-products from the manufacture of coke. This question was referred to in the 34th annual report; but the matter remained dormant for seven years. In the meantime, a change was taking place in the introduction of better coal-washing machinery; and the first large company to undertake the erection of the necessary plant was the Great Western Colliery Company, Limited, at their works at Pontypridd. These works were registered in 1904; and since that date as many as nine coke-oven bye-product plants have been erected in South Wales, and two more are in process of completion.

The following figures show, in terms of sulphate of ammonia percentage of total liquor distilled, the various methods employed in dealing with the sulphuretted hydrogen evolved in the manufacture of sulphate of ammonia from gas liquor, and the proportion treated: Proportion of sulphuretted hydrogen treated by the respective methods of disposal—By oxide of iron, 99·7; by combustion, 0·3 per cent.

Eastern and South-Eastern Counties.

There were, states Mr. F. Napier Sutton, 194 works registered in his district; and a total of 274 processes were under supervision. Every registered work has been visited.

Reporting upon gas liquor and sulphate of ammonia works, Mr. Sutton says that 93 works are engaged in the treatment and distillation of gas liquor for the manufacture of various ammoniacal compounds. These include sulphate, carbonate, chloride, and nitrate of ammonia, liquid (concentrated and refined) and anhydrous ammonia. The total quantity of ammonia produced in the district shows a decrease of 3150 tons (in terms of sulphate), as compared with the previous year. The gas companies produced 91·4 per cent. of the products, the balance being made in the works of private firms.

The methods used at the various works for dealing with the sulphuretted hydrogen evolved in the distillation process and the proportion of gas so treated, in terms of sulphate, and per cent. of total liquor distilled, is as follows:—

To vitriol chambers	66·9
By Claus process	12·6
By oxide purification	14·5
By neutralization after combustion	5 2
By coal gas purifiers ("direct recovery")	0·2
By combustion *per se*	0·6
Proportion of liquor distilled by the continuous process	99·1

It is thus seen, he remarks, that by far the largest proportion of sulphuretted hydrogen is utilized direct for the manufacture of sulphuric acid, which is used again for sulphate of ammonia manufacture. Oxide purification, however, is in use at the large majority of works, which number 61. Treatment by the oxide-heap system finds increasing favour, and is extending to works of large size. Where properly carried out, the system has many advantages over the box purifier system; and where dissatisfaction has been expressed, it is generally found to be due to faulty gas distribution within the oxide mass. In very wet seasons, overhead protection is necessary, and best takes the form of a span-roof on uprights, affording protection from excessive rain, but allowing free circulation of air. The cost of treatment by this method has been carefully kept during six years at a works producing 1000 tons of salt per annum, and has averaged 6·18d. per ton of sulphate made for the whole period, and 4·5d. for the last year. The Claus sulphur recovery process is used at seven works. Bauxite has been substituted for iron oxide as the catalytic agent at one works, and has given distinctly improved results. The sheet-lead sulphur depositing chamber used for over six years remains in excellent condition; and it is a matter of some surprise that the advantage of this form of chamber has not been generally recognized. The combustion-neutralization method of treatment is employed at ten works; but at one of these the method has quite recently been discarded for oxide-heap treatment.

There has been a very marked decrease in the yields of ammonia at two works where vertical carbonizing retorts have been installed, and also at a third where regenerative settings have replaced an older type of retort plant. The cause would appear to be the higher heat of the gas leaving the settings, and insufficient cooling of it before reaching the washing plant. Strong exception had to be taken to the continued use of a completely worn-out and obsolete distillation plant of intermittent type, which had been a source of anxiety for some time. The plant has now been demolished, and is being replaced by a modern distillation plant with oxide-heap purifiers. In all other cases the condition of plant and conduct of operations has given satisfaction, and no nuisance or complaint has to be recorded.

The number of tar dehydration and distillation works has increased to 24, by the registration of two new plants. One of these is for the dehydration of water-gas tar; and the plant has been most admirably designed. A considerable amount of naphtha comes away with the water, and is subsequently redistilled.

Seven Wilton's "coil" dehydrating plants are now in use in the district. Attention has had to be called to the necessity for some relief from internal pressure other than that afforded by the foul-gas pipe to the purifier, or other pipes controlled by cocks, where receiver lids are fastened down. At certain works employing this type of plant, large quantities of naphthalene distil over and separate from the "light oils" on cooling. This points to excessive heating of the tar in the coil. Where this has been reduced, the trouble has ceased; and yet the tar has been effectually freed from water. Again, in many cases all the lightest spirit (naphtha) is lost through insufficient cooling of the condenser-worm, and subsequent undue exposure of the distillates.

At all the large distillation works the tar is preheated and freed from extraneous water before passing to the stills for final fractional distillation—thus saving much time and fuel. This preliminary heating is done by utilizing waste heat from boiler-flue gases, condensers, &c.; but successful use has recently been made at one works of the high heat of the outgoing pitch, which passes continuously through a large cooler containing the heating coil. The heat interchange is thus mutually useful. Appliances and methods for the treatment of the permanent noxious gases from the still-worms are in all cases satisfactory.

Report to the Secretary for Scotland.

In his report on the work done in Scotland during 1914, the Chief Inspector (Mr. W. S. Curphey) states that the production of sulphate of ammonia was decidedly less than in 1913. This was due to the marked reduction in recovery from blast-furnace gases in the iron-smelting industry. The comparative figures are:

	Variation from 1913.
Gas-works	736 tons increase.
Iron-works	3851 ,, decrease.
Shale-works	312 ,, ,,
Producer-gas, &c., works	39 ,, increase.

The large decrease in iron-works production is equivalent to 20·7 per cent. of the production in 1913. It more than neutralizes the increased production of 2693 tons reported for that year. The negligible increase of 39 tons recorded for producer-gas, &c., works is not attributable to any increase in utilization of coal in the various works of this group, but coincides with the commencement of recovery of ammonia and other bye-products from peat. The utilization of this raw material is receiving attention in different countries; and a wide field is, Mr. Curphey urges, open to a process yielding commercially successful results. The increased production from gas-works liquor is worthy of note, when the conditions of external urban illumination consequent upon the war are remembered. The gas industry in Scotland, if measured by its sulphate of ammonia production, would appear to be in a vigorous condition. As yet little progress has been made as regards the adoption of the direct process in the treatment of gas liquor.

The report of Mr. J. W. Young, the District Inspector (which is included in Mr. Curphey's report), shows that the number of registered works was 170, at which 301 scheduled processes were in operation. The liquor distilled from gas-works was equivalent to 22,362 tons; and the noxious gases evolved were destroyed as follows: In oxide of iron purifiers, 68 per cent.; by combustion, 20; by the Claus process, 11; precipitated by metallic salts, 1. The average acidity of chimneys at these works was 0·60 grain; from coke-ovens, 0·48 grain.

The injurious effects produced on oxide of iron purifiers by excessive steam to the still, and by imperfect cooling of the foul gases leaving the saturators, have again been noted. Last year's report cited the dangerous use of galvanized iron pails in connection with the cleaning of saturators. Nevertheless, at one works no heed was given to the warning, and an attendant perished. It is possible, says Mr. Young, that the metallic pail and the death had not the relation of cause and effect; but the risk was taken unnecessarily.

A death during the cleansing of a tar-still is recorded. There was properly fitted the short safety length of pipe destined to be removed before entrance, and there were also suitable valves designed to be closed. Yet men were allowed to enter with the valves open, and before the safety-pipe had been cut out. One was overpowered by the fumes of pitch from an adjoining still. While gladly mentioning the courageous attempts at rescue,* Mr. Young's comment is that "forethought would have been better."

STOCKTON-ON-TEES GAS-WORKS MANAGEMENT.

Resignation of Mr. William Ford.

At a Special Meeting of the Stockton-on-Tees Corporation Gas Committee on the 25th ult., the Chairman (Alderman Harrison) reported that he had received a letter from Mr. William Ford, tendering his resignation as Manager.

In this letter, Mr. Ford, referring to an interview at which he was informed that the Gas Committee desired to revert to the system of management in vogue at the works prior to the appointment of an Assistant-Manager, said that, though he was quite capable of managing the works on these lines, he felt, after 46 years' arduous and faithful service, that he had earned a rest. He therefore tendered his resignation as Manager, but expressed the hope that some arrangement might be come to whereby his services could be retained in some form or other in connection with the undertaking whose interests he had served for such a long period.

The Committee resolved that the resignation be accepted with regret, but that Mr. Ford be requested to continue in office until his successor takes up his duties; that the Council be recommended to express, in the form of an address, their thanks to Mr. Ford for his long and faithful services; that advertisements be issued for a successor at a salary of £500 per annum, rising to a maximum of £700; and that the Council be recommended to appoint Mr. Ford, on his relinquishing the management of the works, to the office of Consulting Engineer, at a salary of £250 a year.

Referring to the matter, the "North-Eastern Daily Gazette" of last Tuesday said: "The resignation, through advancing years, of Mr. William Ford from the position of Gas Manager of Stockton has been contemplated so long that it does not come as a surprise. To have served one Corporation for 46 years is a record which belongs to few officials; and in that time Mr. Ford has rendered most faithful and valuable services. During his long connection with these works, they have contributed annually large sums in profits to the relief of the rates; and though Mr. Ford will soon cease to manage the concern, it is proposed that he should be retained by the Town Council as Consulting Engineer. The question of a successor to Mr. Ford is not yet being considered; but it is well known that the Corporation are in the fortunate position of having, in Mr. Matt. Dunn (in the position of Assistant Manager, which he has held for over twelve years), one who stands foremost in the gas world from knowledge and experience in the manufacture of gas and its bye-products."

The recommendations of the Committee were considered by the Corporation at their monthly meeting last Friday; and after discussion it was agreed to appoint Mr. Dunn as Manager.

Alderman Harrison (the Chairman of the Gas Committee), in moving the adoption of the proposals set out above, referred at length to the services of Mr. Ford, and mentioned that 46 years ago, when he commenced his duties as Manager, they had 3000 consumers, and the annual make of gas was 54,000,000 cubic feet. Now they had 17,478 consumers, and the make was 429 000,000 cubic feet. Mr. Ford was a Gas Manager of the greatest eminence; and during his lifetime his services had been requisitioned in different parts of the country as an expert in gas manufacture. He hoped the Council would be unanimous in retaining him as Consulting Engineer.

Mr. B. Watson, in seconding, also referred in eulogistic terms to the faithful services of the veteran Manager.

Mr. Downey moved that the recommendation with regard to advertising for a successor be deleted, and that in its place it be decided that Mr. Matt Dunn, the Assistant-Manager, be appointed at a salary of £450, for twelve months, at the end of which time the position be revised. In Mr. Dunn, he said, they had a man who had served 12½ years in the position of Assistant-Manager; and in this time the Committee had had an opportunity of judging whether or not he was qualified for the position. They must in this matter consider the future of a man like Mr. Dunn, and they could not do as the Gas Committee suggested without damaging his future. If they did advertise, they could not get a manager with better paper qualifications than had Mr. Dunn. ["Hear, hear."] He considered that it was the duty of the Committee to have given the Council an opportunity of discussing whether or not Mr Dunn should receive the appointment, and it was with this object that he moved his amendment.

Mr. Natrass seconding, said the amendment was a proposal of fair-play to a skilled servant.

Mr. Dennison said, as one who had taken some part in the question which had led to the present position, he would like to explain that the Gas Committee were not prejudiced against Mr. Dunn; but they decided to advertise, feeling that if they proposed to put Mr. Dunn straight away into the post of Manager the Council might not accept it. Not a single member of the Gas Committee had any doubt about Mr. Dunn's qualifications.

Mr. Watson said that in view of their having recently filled the position of Borough Engineer by advertising and not promoting the Assistant-Engineer they were obliged in the present case to advertise for the best man, whether it was Mr. Dunn or anyone else.

Mr. Bowman, speaking as one who had worked at the gas-works, said they had in Mr. Dunn a Manager quite as well qualified as was Mr. Ford.

Alderman Harrison said he was pleased that Councillor Dennison had explained the position of the Gas Committee, because, though he, as Chairman, moved the confirmation of the minutes, he was certainly going to support the amendment. Several members of the Committee to whom he had spoken were strongly in favour of appointing Mr. Dunn directly to the post of Manager; but they were afraid that to do so might prejudice his chances for the office. Mr. Dunn was a man of excellent abilities; and it would have to be an exceptionally brilliant man to get his vote against Mr. Dunn.

Mr. Cohen said they were gratified to have such an expression of opinion from the Chairman of the Gas Committee.

After further discussion, Mr. Downey's amendment was carried by 22 votes to 12.

An amendment to fix Mr. Ford's retaining salary at £150 was defeated; and the Committee's recommendations respecting Mr. Ford were carried.

Dearer Gas at Lymm.—The Lymm District Council at their last meeting approved a recommendation of the Gas Committee that the price of gas be increased as follows: Ordinary consumers for lighting, from 3s. to 3s. 6d. per 1000 cubic feet; cookers, fires, &c., from 2s. 8d. to 3s. 2d.; and that no discount be allowed to prepayment meter consumers—the increases to take effect from the June meter readings.

Economy of the Use of Gas.—The Bradford Corporation Gas Department have taken advantage of the Government's call upon the nation for economy by circularizing the citizens, drawing their attention to the economy of the use of gas. The following passage occurs in the circular: "The public are reminded also that the use of coal for heating and cooking is wasteful—wasteful both in a domestic and in a national sense. Very important products are extracted from coal during the process of gas manufacture which are used to make the most powerful explosives required by the Army and Navy. By the continuance and extension of the use of gas the public are indirectly preserving and increasing the supply of these valuable explosives. Consequently there are more reasons than ever why householders should employ gas rather than coal for cooking and heating."

Street Lighting Charges at Brownhills.—The Brownhills Urban District Council have been considering tenders for street lighting for the ensuing season. It appeared that, owing to the war and consequent increase in the cost of coal and other materials and wages, the Ogley Hay and Brownhills Gas Company asked for an increase of 6s. 10d. for each lamp, the tender being £2 19s., against £2 12s. 2d. The Cannock, Hednesford, and District Gas Company asked for an increase of 6s. per lamp; the price being £2 4s., against £1 18s. For the part of the district lighted by the Walsall Corporation it was stated that the Council had a three years' agreement. Some members thought the increased charges unreasonable, and said that rather than pay so much they would do without street lighting altogether. It was resolved that the Clerk should write to the Companies to ask them to revise their terms.

PLYMOUTH AND STONEHOUSE GAS COMPANY.

High Freights and the Cost of Coal and Oil.

There was a large attendance of shareholders at the annual meeting of the Plymouth and Stonehouse Gaslight and Coke Company, which was held on Tuesday last—Sir Joseph A. Bellamy (the Chairman) presiding.

In their report, the Directors stated that they considered the results of the past year satisfactory when it was remembered how exceptional had been the coal difficulties arising out of the war. In order to meet the heavy increased costs in connection with coal deliveries, and to provide the contribution to the Company's men who joined the forces, as well as pay the employees' war allowance, it was found necessary to advance the price of gas from 1s. 9d. to 2s. per 1000 cubic feet as from September last. It was anticipated that the high prices ruling in the coal and oil markets for new contracts would necessitate a still further advance in the price of gas in the autumn. The Directors reported, with much gratification, that no fewer than 63 of the Company's employees had joined the forces. The demand for gas was still increasing, and its use, apart from lighting, was rapidly becoming general where convenience and economy in heating were a consideration. A considerable increase in the output of gas had been occasioned by the demand at the forts and hutments at Crownhill. The revenue account for the year showed that the receipts totalled £149,468, as compared with £144,906 last year. From sales of gas the amount received was £114,996, as against £103,509; and meter and stove rentals yielded £8685, compared with £8547. Residuals, however, were down from £31,181 to £24,405. On the expenditure side were: Cost of manufacture £97,525, compared with £101,001 last year; distribution £10,160, as against £7786; rents, rates, and taxes, £4309, as against £4686; and management £6527, as compared with £6182. A new item was "active service" pay, £821. The total expenditure (£121,175) was almost exactly the same as last year (£121,125); but the balance carried to profit and loss account (£28,2,2) was £4511 more. The quantity of coal carbonized during the year was 64,927 tons, and the oil used 1,622,581 gallons. The coke produced was 38,866 tons and breeze 8318 tons, of which 13,195 tons of coke and 5463 tons of breeze were used on the works; the remainder being sold. Of tar, 788,021 gallons were made, and of sulphate of ammonia 592 tons.

Coal and Transport Difficulties.

The Chairman moved the adoption of the report and balance-sheet, which he said were very satisfactory in the circumstances. War had brought about adverse conditions which had to be faced, and the only thing the Directors could do was to limit as far as possible the expenditure in all directions. A serious crisis was caused by the Government, in the interest of the State, commandeering steamers, with the result that an insufficient number of vessels was left to carry coal. Up to that time the Company had relied entirely on seaborne coal. It had been best for them to work with steamers instead of railways, both in regard to cost of carriage and facilities for getting supplies regularly. Like many other gas companies receiving coal by sea, they were caught in an unfortunate position; for although they had a contract with a very large and capable firm of shipowners, so many ships had been taken over by the Government that the firm were quite unable to supply the tonnage necessary to bring their coal to Plymouth. The Directors did not accept at the time the position taken up by the shipowners. Their contract was worded in a way rather advantageous to the Company, and they claimed that the shipowners should charter other steamers, whatever the price might be, and send along the coal. However, it was impossible to get all the coal they required by sea. So they had to try to get supplies by rail from Wales and Yorkshire, where they did not usually buy coal for gas making. It was not a success. They had to pay very high prices, and the railways could not deliver in anything like a reasonable time; but they had to obtain some hundreds of tons in this way to keep the works going and the town supplied with gas. Since this crisis passed they had met with very considerate treatment from the steamship owners with whom they had the contract; while the Directors, on their part, recognizing that the conditions were abnormal, had not demanded all that they might possibly have obtained by litigation. The Directors made some concessions in regard to war risks insurance and in other ways; and the shipowners fully appreciated their action. So they had arrived at their present position without litigation, and they had got their coal for the time being. Other difficulties had been caused by various restrictions placed upon their business to meet Government requirements—the commandeering of their steam-waggons and in other ways. They had met these difficulties loyally, recognizing that the Government had to carry on the business of the country, and that the interests of the Company must come second.

Increased Production and Sales.

During the year they had had to increase the price of gas to a small extent, and they had hoped this would be sufficient; but at a later date a further advance would become imperative. One reason why the balance-sheet was not so good as it might have been was that they had realized a good deal less by the sale of coke. Still, the position of the Company was perfectly satisfactory in the circumstances. In the past, by careful working and the judicious expenditure of capital, they had managed to modernize things, and so placed themselves in a better position than they occupied some years ago for dealing with adverse circumstances as they came. The consumption of gas had increased in the past three years by 132 million cubic feet; the total consumption for 1912 being 1,096,835,000 cubic feet, and this year 1,229,736,000 cubic feet. When it was remembered that they had a very strong competitor in electric lighting, they had reason to be proud of these figures. The number of private consumers, apart from slot consumers, which in 1912 was 16;830, had increased by 832; and the slot consumers, who in 1912 numbered 15,204, had increased by 3365. This showed that the Company treated their customers well. There had been an increase in the three years of 1965 in the number of cookers, and of 805 in the gas-fires on hire, and they had also 512 hot-water circulators installed. By good management and skill on the part of the Engineer and his staff, they had increased the make of gas per ton of coal carbonized from 11,790 cubic feet in 1913 to 12,328 cubic feet—an increase of practically 5 per cent. A few years ago they put up machinery for storing and dealing with coke in an economical way, and this had proved very advantageous. It saved labour; and as the entire stock of coke was kept under cover, purchasers obtained it dry, and had not to pay for perhaps 20 per cent. of water which was absorbed when the coke was stacked in the open.

COAL AND OIL CONTRACTS.

With regard to the future, the Company stood upon a sound foundation, and the business would continue to prosper. The set-back brought about by the war was only of a temporary character. A short time ago difficulty was caused by the announcement of the coalowners that they would not be able to maintain supplies of coal owing to the number of miners who had enlisted. This brought about a serious state of things. Gas companies who sought to make contracts found that prices had jumped up 100 per cent. in excess of last year's figures. In these circumstances, the gas and electricity companies joined in representations to the Government; and he was appointed a member of an influential Committee who held sittings in London. The position had now improved considerably. Instead of the collieries stating that they could not supply coal at all, or that they could supply only 50 or 70 per cent. of the quantity previously supplied, they had arrived at the position that coal could now be bought. Prices weakened, though not to a very considerable extent; and the Company had made their contracts for the next twelve months at a price with which they were very well satisfied. In regard to the supply of oil, in placing their contract they had to pay 100 per cent. more than last year. It was fair to say that this arose not from an increase in the price of oil at the port of shipment, but from the scarcity of tank-steamers and the consequent increase in freights. Last year's freights from Atlantic ports were about 18s. per ton; while this year they were 60s. These advances would necessitate an increase in the price of gas, and a consequent reduction of the dividend.

THE CO-PARTNERSHIP SCHEME.

Sixty-two men from the Company's works had joined the Colours; and they had had to say that they dared not let others go if they were to maintain the supply of gas. The men were loyal and worked well; but it had to be recognized that ten men could not do the work of twenty. Mr. Hoyte, their Engineer, had accepted, with the consent of the Directors, a position under the Munitions Committee. In regard to the co-partnership scheme, they started with a standard price of 2s. per 1000 cubic feet, and when the scheme originated and gas was 1s. 7d. per 1000 cubic feet, the men had a bonus of 5 per cent. Last year, with gas at 1s. 9d., they had 3 per cent. But gas was now 2s., and the Directors had been considering what should be done. With the consent of the shareholders, they proposed to take a generous course. They declined to take up the position that because war had broken out the co-partners should not have anything, and it was decided that they should have a sum which would work out proportionally at 3 per cent. on their wages. The men had worked well, and backed the Company up in every way they could. The Directors had also been giving gratuities to the officers and men of the ships which brought their coal. It had been his ambition to keep the price of gas at Plymouth lower than the price at Newcastle, where their coal came from. To-day the price at Newcastle was 2s. 1d., and at Plymouth 2s. How long they would be able to maintain this record, he did not know; but they had done it for many years, and he hoped it would continue. In conclusion, the Chairman referred specially to the services rendered by the heads of departments.

The report and balance-sheet were adopted, and a special resolution was passed for the payment of the sum (£881 11s. 2d.) required for the co-partnership scheme. Dividends were authorized at the rate of 5¾ per cent. on the ordinary stock and of proportionate amounts on other classes of shares.

Mr. H. R. LAVERS, on behalf of the workpeople, thanked the Directors and shareholders for the concession made to the co-partners.

MALTA AND MEDITERRANEAN GAS COMPANY.

The Usual Dividends Declared.

The Ordinary General Meeting of the Company was held last Tuesday, at the London Offices, Nos. 59-60, Gracechurch Street, E.C.—Colonel JAMES LEGEYT DANIELL in the chair.

The SECRETARY (Mr. C. J. Daun) read the notice convening the meeting and the certificate of the Auditors; and the report of the Directors and the statement of accounts were taken as read.

The CHAIRMAN, on rising, said he would be failing in his duty if he did not first of all make some allusion to the death of the late Auditors—Mr. R. Hesketh Jones and Mr. Thomas Guyatt—which, strange to say, occurred within a fortnight of each other. The Directors had no hesitation in offering the auditorships to Mr. Ernest L. Burton and Mr. William Cash, who had been through the accounts on the present occasion, and would now submit themselves for re-election. Colonel Clarke was sorry not to be able to be present at the meeting, but being this year High Sheriff for the County of Sussex, he had to attend on the Judge of Assize. In moving the adoption of the report and balance-sheet, he said he had to express the regret of the Directors at having found it necessary to keep the shareholders waiting a little while for the accounts; but he felt sure they would understand that the war had put everything out of gear, and that the meeting had been called at the earliest possible moment. Now that the proprietors had the accounts before them, the Board trusted that they would not be disappointed. It would be observed that the accounts were very much the same as those for preceding years. Taking the profit and loss account first, it would be found that the cost of coal, &c., and the sale of gas were practically the same. There had been a falling off, under the heading of residuals, of some £1630. The General Manager reported that, in addition to the fact of the war interfering with the export of coke, the prices at Malta and elsewhere were not so good as in the preceding year. Really the only other point on the debit side of the account was the depreciation of investments by £696. In the previous year, they had to write them up slightly; but on this year's valuation, they had fallen by the amount named, which was not surprising. In the general balance-sheet, on the credit side stocks at stations figured at more, and sundry debtors at less, than last year. They were items which, of course, varied according to circumstances—this time in the right direction. On the debit side, the amortization had increased by the amount of interest accruing on its investment. The debenture debt stood at £8000; and he could remember the time when it was £45,000. The average make of gas per ton of coal carbonized at all stations was 12,361 cubic feet. Credit was due to the management abroad for the way in which they had endeavoured to control the expenditure at the different stations. In fact, he could not resume his seat without bearing testimony to the manner in which the staff had worked, and brought about the results which the shareholders had before them. They always received the suggestions and instructions of the Board in the right spirit, and took pride and pleasure in giving effect to them. The proprietors would be glad also to hear from him that the appointment of Mr. Daun as their Secretary had been a great success. There was one matter of a somewhat personal character which he wished to mention. The Company had been in the habit of paying the Directors their fees in full. The Directors would like to be indemnified with regard to the past; and the Auditors would be glad to have authority for their guidance in future. This could only be effected by a special resolution; and the Board did not propose to do it at the present moment. Probably they would look carefully through the Articles, to see if anything else suggested itself for alteration, and would then call the shareholders together to carry the matter through.

Mr. A. M. PADDON formally seconded the resolution, which was agreed to without discussion.

On the proposition of the CHAIRMAN, seconded by Mr. A. F. PHILLIPS, dividends were declared at the rate of 7 per cent. on the first preference shares, 7½ per cent. on the second preference shares, and 6 per cent. on the ordinary shares (the last named free of income-tax) for the year ended March 31—deducting the payments made on account.

Proposed by the CHAIRMAN, and seconded by Mr. E. L. BURTON, the retiring Director (Colonel Stephenson R. Clarke, C.B.) was re-elected.

Mr. JOSEPH CASH, in moving the re-election of the Auditors (Mr. E. L. Burton and Mr. William Cash), said he regretted very much the loss of the two Auditors who had served the Company for so long. Mr. Hesketh Jones he had known for perhaps forty years, and Mr. Guyatt for twenty. These two Auditors could not possibly have been replaced by better men than had been appointed, and now sought re-election.

Mr. F. R. SMITH seconded the resolution, which was unanimously passed.

The CHAIRMAN said it afforded him much pleasure to propose a hearty vote of thanks to the staff, for the excellent manner in which they had, one and all, conducted their duties. He mentioned by name the Secretary, the General Manager (Mr. Starkey), the Chief Engineer (Mr. Reid), and the two Managers at Trapani and Marsala.

Mr. F. W. CROSS said that, as an old gas manager who had served abroad, he knew the difficulties of such a position, and therefore he had particular pleasure in seconding the resolution.

The proposition was cordially agreed to, and suitably acknowledged by Mr. DAUN.

The proceedings concluded with a similar compliment to the Chairman and Directors, on the motion of Mr. JOSEPH CASH, who remarked that, while the past year had been one of the most difficult experienced, the next one would probably be even more so. The accounts of the Company were certainly very satisfactory, taking into consideration all the circumstances of the case. The shareholders could not do less than tender to the Board their heartiest thanks.

Mr. WESTBROOK seconded the motion, which was acknowledged by the CHAIRMAN.

HARWICH GAS COMPANY'S NEW PREMISES.

The Harwich Gas Company are now installed in new, commodious, and altogether desirable premises. They have removed their offices and store from Harwich to Dovercourt, where they not only boast of up-to-date offices and equipment, but also of a spacious show-room, replete with all the latest appliances to be found in such a building. The new premises are situated in the High Street in the most central and busy part of the borough. The buildings are of red stone and brick, enriched with carving in the classic renaissance style. Entering the premises from the High Street, one passes through a corner entrance-lobby to the show-room and inquiry office, which is 31 feet by 26 feet. The office portion of the show-room is replete with the latest furniture and fittings; and the show-room itself is well stocked with the latest and most modern stoves, radiators, grillers, and other appliances, of the best makers on the market. One of the exhibits is a Wilson fire, surmounted by an oak mantelpiece, with the recess lined with French tiles. At the rear of the show-room is a lobby opening into the Secretary's office, with a reinforced concrete strong room, and lavatories adjoining. Mr. George Baines (the Secretary and General Manager) is an old and valued servant. For the long period of 34 years he has been associated with the Company, and has watched its growth and development; and for the last 21 years he has held his present position.

A bold teak staircase leads to the board-room on the first floor. On the same floor, the Works Manager (Mr. W. E. Jolliffe) has a well-equipped office.

At the rear, on the ground floor, is a large unloading-yard, with lofty workshops and stores. The whole premises may be said to be admirably suited to the work of the Company.

CO-PARTNERSHIP IN WAR TIME.

The following remarks on the subject of "Co-Partnership in War Time," by Mr. Charles Carpenter, D.Sc., appear in the July number of the "South Metropolitan Gas Company's Co-Partnership Journal."

No partnership is possible, whether in business or anything else, unless provision is made for the sharing of trouble as well as prosperity, of losses as well as gains. For the second time in the history of our co-partnership (now 26 years old), the bonus has fallen to a considerably lower figure than has been customary. It is regulated, as is well known, by the price at which gas can be sold; and at the present figure it amounts to 2½ per cent. A critic quite recently exclaimed against our system of partnership that it had now been proved a failure, inasmuch as the bonus had gone down through causes for which the participators were in no way to blame, though they suffered by the results. Of course, they do, conjointly with the consumers of gas and the shareholders in the undertaking, who are also out of pocket as the result of happenings equally beyond their control. It is, at any rate, something to take pride in that at a time when the nation is fighting for its very existence, not only are the profits of the undertaking reduced, but those three classes of partners who together enjoyed more prosperous times are now sharing the heavy burden thrown by the present strain upon their resources. I can, indeed, imagine that some of the coal producers are just a little ashamed of the exorbitant prices we have had to pay for our raw material.

In accordance with the notice issued early in the war, the bonus will be credited to all regular men working under agreements, as well as to those of military age who, so that they might feel unfettered in any desire to join His Majesty's forces, have not been allowed to sign-on. The average bonus payable in respect of the last twelve months' service of staff and workmen works out at 6 per cent. on salaries and wages; since only during the latter three months of the time has the price of gas been at its present high figure. There is worse, however, to come; for nothing can prevent the bonus for the year just commencing being below that just declared.

Too great heed, therefore, cannot be given to the advice of the Government that the most careful economy should be practised by everyone. When all was seemingly going well with us as a nation, we were paying for the necessaries we imported by merchandize we manufactured and exported. We are far now from being in this happy position. In order to live, we must go on with the import of necessaries. But instead of exporting manufactures, we now have to send out of the country our needed gold to pay for them. We shall all be "doing our bit" for our country better if we realize this, and give effect to that knowledge by helping to husband her strength while we give her unrestrictedly the fullest measure of our own effort. At no time in our history as a nation has that effort been more needed.

There is not room for all of us in the trenches or on the battleships. There is plenty of scope for those left behind to work unceasingly in the task of providing the requirements in munitions and equipment of those bearing the heat and toil of the fight on the seas or in a foreign land. Fortunately, the part played by gas undertakings in a crisis such as the land is passing through is being recognized more and more each day. When I think of the enormous amount of time and energy so many of our staff are putting into what may be well called "first aid" for the country, I cannot help feeling how great is the debt to co-partnership, which has taught all its participators to look at things from a wider standpoint than would be possible in the case of the ordinary workman or his leaders. Let us hope their efforts may be crowned with success before the declaration of another bonus.

ROYAL SOCIETY OF ARTS.

The Council's Report for the Past Year.

At the 161st Annual General Meeting of the Society held on Wednesday last, the report of the Council for the past twelve months was submitted, in the course of which it was announced that the Society's Silver Medals for papers read during the session 1914-15 had been awarded to (among others) Mr. H. M. Thornton for his paper on "The Industrial Uses of Coal Gas," to Mr. Charles Darling for his paper on "Recent Progress in Pyrometry," and to Sir William A. Tilden for his paper on "The Supply of Chemicals to Britain and her Dependencies."

In the course of their very extensive report the Council make the following remarks:

The first two papers after the opening address dealt with the question of industrial supplies to which attention was first devoted after the breaking out of the war—namely, the supply of chemicals. It has been for long a matter of common knowledge that almost the whole of the chemical reagents employed in industries in this country came from Germany. A typical instance of this is the supply of dye materials The story has been told over and over again how the infant industry of the development of coal-tar colours originated in England, and, after being carried on to a considerable point of success, was transplanted to Germany, and there, by a combination of skilfully applied capital and wisely directed chemical research, developed into by far the greatest scientific industry which the world has ever known. The natural result was that the manufacture of coal-tar dyes, with all the innumerable products associated with their manufacture, came to an absolute cessation in England, which has been allowed to rely wholly upon Germany for all the chemical products required. The subject was very ably dealt with in two papers—one by Sir W. Tilden and the other by Dr. W. R. Ormandy.

In his paper on "The Industrial Uses of Coal Gas," Mr. H. M. Thornton gave an exhaustive account of the numerous applications of gas to purely manufacturing purposes. It must have been more or less a revelation to all who are not specially cognizant of the developments of gas manufacture to know in how very many cases gas has taken the place of solid fuel for industrial purposes. This application of gas is of comparatively recent introduction; and the Chairman of the meeting mentioned the fact that when Sir Corbet Woodall took the chair at a meeting of the Society thirty-five years ago, he stated that at that time not more than 5 per cent. of the gas used was employed for purposes other than lighting. At present about 40 per cent. is so used; and yet it was the opinion of those best qualified to speak on the matter that this only marked the beginning of the era of the industrial application of gas.

Dr. Augustus Vernon Harcourt's contribution was mainly intended to describe a simple instrument he had constructed for the measurement of radiant heat from domestic fires, and a grate he had himself devised for the economical combustion of coke. It, however, contained also a good deal of information on the subject generally. An interesting side-issue was his demonstration of the futility of expecting to increase the amount of heat generated from coal by the use of any nostrums applied to the fuel during combustion.

Mr. Charles Darling, in his paper on "Recent Progress in Pyrometry," may be said to have completed the information provided in his Cantor Lectures of 1911, by bringing the matter down to date; and he certainly showed that there had been very considerable progress made in pyrometry since the admirable course of lectures referred to.

It must be admitted that in his paper on "The Industrial Uses of Radium," Mr. Thorne Baker rather dealt with the future than with actual achieved results. He, however, gave a very interesting account of the experiments which had been made to test the effects of applying solutions of radium salts to aid vegetation growth, and held out considerable prospect that these experiments justified the expectation of valuable results in the immediate future.

The course of three lectures on the subject of "Motor Fuels" given last session under the Fothergill Trust by Professor Vivian B. Lewes was very appropriate to the present time, when the use of petrol as a fuel on land, on the water, and in the air has become so important for warlike purposes.

The Albert Medal of the Society for the current year has been awarded to Professor Sir Joseph John Thomson, O.M., D.Sc., LL.D., F.R.S., for his "Researches in Physics and Chemistry, and their Application to the Advancement of Arts, Manufactures, and Commerce."

SUSPENSION OF SINKING-FUNDS.

Position of Gas Undertakings.

The question of the suspension during the war of sinking funds in connection with municipal gas undertakings was raised at a meeting last week of the Annual Committee of the Convention of Royal Burghs, in Edinburgh.

Mr. Alexander Morrison (Bridge of Allan) remarked that they were being called upon every day to exercise economy; and this economy, he held, could be exercised as much in the consumption of gas as anything else. The increased price of coal had increased the price of gas. One way in which this might be neutralized was by dealing with the sinking funds. He moved that the Convention approach the Scottish Office to have the sinking-fund provision of the Gas Supply Act, and the corresponding provision of other Acts under which the undertakings were administered, suspended during the operations of the war.

It was, however, moved and seconded that the whole question of sinking funds during the war be remitted to a Committee for consideration and report; and this amendment was carried.

Subsequently the following letter on the subject was addressed by "A. C. W." to the Editor of the "Scotsman."

It is to be hoped that the very sensible suggestion made at the meeting of the Annual Committee of the Convention of Royal Burghs by the Town Clerk of the Bridge of Allan—viz., that, during the war, local authorities be empowered to suspend their contributions to sinking funds—will materialize.

The proposal is particularly pertinent in respect of municipally-owned gas and electricity undertakings, which are likely to be severely hit by the abnormal advance in the cost of coal and other material, by war allowances and bonuses, and by economy of consumption on the part of the public. The capital expended in ventures of this kind is usually amply secured; and there seems to me to be no sound argument against a temporary cessation of these contributions, which, in many cases, would make increases in the price of gas or electricity unnecessary, and in others materially reduce the increases. In exceptional times, exceptional measures are justified. Of late years much has been done to stimulate the use of gas for cooking, heating, and manufacturing purposes; and it would be most unfortunate if greatly advanced rates for this commodity were to cause a serious set-back, and a consequent addition to the pollution of the atmosphere by smoke.

The Local Government Board have been approached from more than one quarter on this sinking-fund suspension question; but nothing appears to have resulted. Perhaps, under a Coalition Government, and in view of the alarming increases in the price of gas and electricity which are reported in the papers almost daily, common sense may yet prevail.

War Loan Contribution at Droitwich.—When introducing the annual report on the working of the Droitwich gas undertaking, as noticed in last week's "JOURNAL," the Chairman of the Lighting Committee (Alderman J. Gabb) said that, though so many authorities were raising the price of gas, they did not intend to do so at Droitwich. Consumers, when they came to consider the matter, would no doubt conclude that they had been served well. The Committee concurred in a suggestion of the Mayor that the £250 put to reserve should be invested in the new war loan—feeling, with him, that every encouragement should be given to the Government at this critical time.

OLDHAM GAS-WORKS RESULTS.

Annual Statement of Accounts.

The report of the General Manager (Mr. Arthur Andrew) to the Gas Committee on the working of the Oldham Corporation gas undertaking for the year ended March 25 states that the gross revenue on gas-works account amounts to £184,732, and the gross expenditure to £161,102; the balance carried to profit and loss account being £23,630. Annuities, interest, and sinking fund figure at £31,851, making the net loss on the year's working £8221, to which there is added the amount paid to the borough fund £7500, and depreciation on gas cooking stoves £1650, making a total deficiency for the year of £17,371. As the credit balance brought forward was £7262, there is a debit balance to be carried to the next accounts of £10,109.

The loss on the year's working of £8221 is caused principally by the great decrease in the amount received for residual products. A sum of £917 has also been paid as an allowance to those employees of the department who have joined His Majesty's forces. The net price realized per 1000 cubic feet of gas sold during the past year was 1s. 10·33d., as compared with 1s. 10·18d. in the year previous. The deficiency of £17,371 (which includes £7500, the amount the Corporation are entitled to appropriate in aid of rates) is equivalent to 2·790d. per 1000 cubic feet of gas sold. Until the beginning of February, coke was very difficult to dispose of, even at low prices; and the improvement which then occurred was not sufficient to make the average price equal to last year. The stock of coke in December reached the large figure of 14,000 tons. Tar has been markedly affected; and some of the products have been practically unsaleable—pitch particularly. In order to avoid the heavy loss which would have been unavoidable if pitch had been forced on the market at the low prices ruling after the outbreak of war, arrangements were made to purchase the pitch from the tar contractors, with the object of storing it until a better price is obtainable. The amount in the reserve fund on March 25, 1914, was £47,692; and interest has accrued to the fund to the amount of £1447. The sum of £8580 has been taken out of the fund and placed to the credit of capital account, which sum is the estimated value of discarded plant at the various works. The amount standing to the credit of the fund on March 25 last was £40,560, against which there is a balance of loss on the profit and loss account amounting to £10,109, which will reduce the amount available to £30,451.

The quantity of gas made was 1,636,436,000 cubic feet, against 1,673,870,000 cubic feet in the preceding year, being a decrease of 37,434,000 cubic feet, or 2·23 per cent. The following quantities of coal, oil, and benzol have been used in the production of gas: Coal, 122,372 tons; gas oil, 249,955 gallons; benzol, 26,265 gallons. The average quantity of coal gas made per ton of coal carbonized was 12,510 cubic feet, compared with 12,125 cubic feet in the previous year. The quantity of gas unaccounted for has been 116,669,200 cubic feet, or 7·13 per cent. of the make. The average calorific value of the gas supplied during the year was 573 B.Th.U.

The total number of meters fixed on March 25 last was 57,986—9009 of the prepayment type. Of the total, 580 meters have been fixed in new premises and others in which gas was not previously used, and 122 meters have been permanently disconnected. The actual number of consumers was 51,182. The net increase in the number of additional cooking stoves and grillers fixed during the year was 679. The total number in use on March 25 was 23,488, excluding stoves owned by consumers. The policy of supplying radiators and water-heaters in addition to gas-fires on simple hire terms has led to a very satisfactory demand for these appliances. The number of fires, &c., fixed on simple hire during the year was 1576. There has been an increase in the quantity of gas consumed in houses and shops of 31,719,600 cubic feet, and a decrease of 73,206,300 cubic feet in that used in mills and workshops. The number of prepayment meters in use increased during the year from 7322 to 9009; and the quantity of gas consumed through them increased from 80,152,900 to 98,314,900 cubic feet. The total number of lamps fixed in the supply area on March 25 was 6382.

An installation of vertical retorts at the central works has been completed, and new and enlarged purifiers have also been installed at the same works. The capacity of the plant at this station is now 1,000,000 cubic feet per 24 hours.

Considerable help has been rendered to the Red Cross Society and Belgian Refugees Committee by supplying gas at a low rate, and also fixing cookers and fires on special terms. Assistance has also been rendered gratuitously in the laying of mains, providing and fixing gas-fires, and street-lamps, &c., for lighting and heating purposes, at the Military Camp at Chadderton Park. On March 25 the number of men in the employ of the Gas and Water Departments who had joined His Majesty's forces was 78.

TIPTON GAS UNDERTAKING.

After further consideration of the question of the extension of the plant at the gas-works, and after hearing the report of the Manager (Mr. W. Prince) as to water-gas plant and the rebuilding of some of the old retorts, the Tipton Gas Committee inspected the works and decided to invite tenders for the building of four new horizontal beds in the old house. Two tenders were received; and it was decided to accept that of Messrs. Drakes Limited, on condition that they undertake to have the plant ready for making gas by Nov. 1 next.

The Manager has issued the annual balance-sheet. He congratulates the Committee upon the past year's working, and states that, considering the unprecedented state of the coal market and the depression in the residuals market, they have come through as favourably as most undertakings. In order to meet the additional cost of coal and other materials, and war bonuses and allowances, the sum of £3500 must be raised during the present financial year; and he recommends that the price of gas be further increased 3d. per 1000 cubic feet, to commence from the June quarter's reading of meters. The Committee and the Council have adopted the recommendation.

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OLDBURY GAS PRICES.

At a Meeting of the Oldbury District Council last Friday, the Gas Committee recommended that the royalties charged to consumers in the Birmingham area of supply be discontinued; also that the tender of Messrs. Humphreys and Glasgow for supplying an extension of the carburetted water-gas plant be accepted. They further recommended that the price of gas to ordinary consumers be increased 9d. per 1000 cubic feet, and that the charges to slot-consumers and users of gas for power purposes be increased 8d. per 1000 feet—the increases to take effect from and after the June reading of the meters.

In the course of a long discussion on the report, Mr. Jackson (Chairman of the Gas Committee) explained that they considered it necessary to extend the carburetted water-gas plant, in view of heavy demands expected later on. They had had before them the question of the erection of a vertical-retort house, and the matter was looked upon favourably by the Committee. But as such a scheme would entail a large outlay, it was postponed for the present. Mr. H. Robbins protested against the price charged to manufacturers for gas for power purposes, and asserted that they were selling gas to this particular class of consumer at less than cost price. The Chairman and Mr. J. W. Wilson, M.P., strongly denied this; and the latter gentleman suggested that they should call in an expert to satisfy the Council on the matter. Mr. Jackson referred to the results of last year's trading, and remarked that they received an additional revenue of £543. There was an increased expenditure of £2162, of which £2070 was due to the higher cost of manufacture and wages. There was a net loss of £1549; and he calculated that the reduction of 2d. per 1000 feet in the price of gas in 1912-13 had deprived the Gas Committee of revenue amounting to £3000. They would not have been faced with a deficit now, if this concession had not been made to the consumers. The total increased expenditure this year would be £3750.

An amendment moved by Mr. H. Robbins to refer the report back to the Committee was rejected; and the report was ultimately adopted.

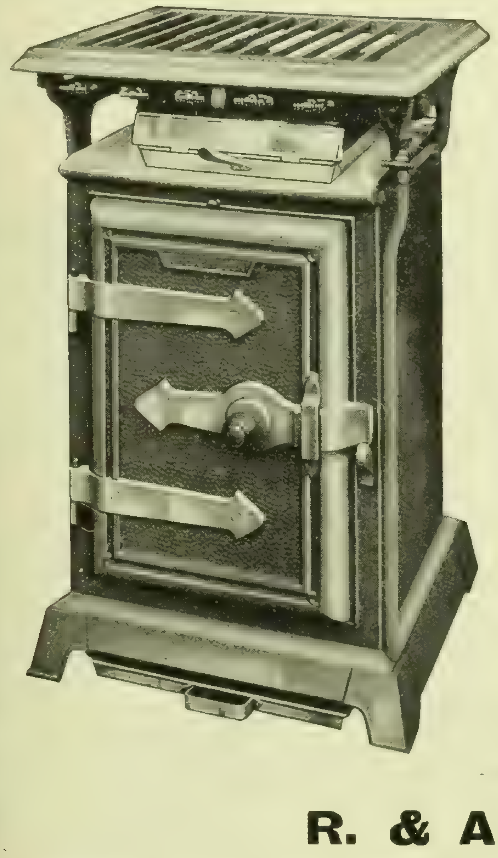
CARBONIC ACID GAS IN THE ATMOSPHERE OF ROOMS.

Under the title of "Modern Views on Ventilation," last Saturday's issue of the "Lancet" publishes from a "Special Sanitary Commissioner" an article which sums up the matter in such a way as induces us to make the following extracts.

Now that so many private dwellings, the public rooms of hotels, assembly rooms, riding schools, school rooms, and all kinds of commodious buildings, not constructed to serve as hospitals, are nevertheless receiving the wounded soldiers as they arrive from the front, the difficult problem of ventilation has to be solved on a very large scale. This calls for all the more attention, as of late years good cause has arisen to show that principles which used to be generally accepted are no longer considered impeccable.

At the beginning of the year an important account of the most recent theories on the subject, and of some valuable experiments, appeared in the "Official Bulletin" of the International Office of Public Hygiene, having previously been published in the "Journal of the American Medical Association." The publication has now been in the hands of public health authorities of thirty-two governments for some little time; and as sanitary reformers in these various countries study the bulletins of the International Office, we may hope that modern teaching in regard to ventilation will become widely known. The care of the wounded renders this question of practical urgency at the present moment.

First, it is pointed out in the bulletin that even before the discovery of oxygen the respired breath was believed to contain a noxious principle; and subsequently the evil was attributed to carbonic acid gas. But at the beginning of the Nineteenth Century the presence of another poison in crowded and inefficiently ventilated rooms was suspected; and in 1851 Cavarret demonstrated that animals died when placed in an overcrowded enclosure, though the excess of carbonic acid was withdrawn and oxygen supplied. Brown-Séquard and d'Arsonval, after condensing the breath of men and dogs, and injecting this into animals, produced symptoms of poisoning. Du Bois-Reymond said this had an albuminous base, and called it "anthropotoxine." Thus the belief in the direct contamination of air by breathing grew—involving the necessity of the constant removal and renewal of air. Nevertheless, so far back as 1842 Leblanc demonstrated that, no matter how crowded a room might be, the proportion of oxygen rarely fell to less than 20 per cent.; and, on the other hand, Regnault and Reiset, only a few years later, showed that the proportion of oxygen could be reduced to 10 per cent. without increasing the rapidity of breathing. At the same time, these and other authorities also demonstrated that air containing far more carbonic acid gas than could possibly be found in the most crowded rooms might be breathed without causing any inconvenience. Pettenkofer later on (in 1862) also insisted that it did not matter if the proportion of oxygen in the air was decreased and that of carbonic acid increased. But though he denied that there was any harm in even a large proportion of carbonic acid, its presence might become a good danger signal, indicating that the atmosphere was likely to be infected. Many other authorities and experiments are mentioned in the bulletin, all alike indicating how the belief that expired breath contained an organic poison was gradually abandoned. In 1883 Hermans (of the Amsterdam Institute of Hygiene) attributed the discomfort and rising temperature from which people suffer when crowded together in an ill-ventilated place not to poisonous atmosphere, but merely to the material difficulty caused by want of space. His simple explanation was that persons in a crowd had not enough air around them to keep their bodies cool, the radiation from the skin of heat, and their evaporating perspiration, maintaining an excess of temperature and humidity.



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He contended that ventilation was a physical rather than a chemical problem.

Professor Haldane, of Oxford, conducted various experiments during 1905, in a specially constructed chamber, in certain tin mines and weaving mills. He insisted that it was the excess of dampness, rather than of heat, that was injurious. The same year, Flügge, Heymann, Paul, and Ercklentz made comparative investigations with sick and healthy subjects placed in a closed chamber. They did not suffer when exposed to an excess of carbonic acid gas or when deprived of the usual proportion of oxygen, nor from any volatile organic poison they might be supposed to expire from their lungs. But they did complain of the excess of heat, of humidity, and of the stillness of the air. For thirty years experiments had been suggesting that neither carbonic acid nor some mysterious poison generated by the process of breathing was the cause of the evils which ventilation is expected to remedy; and at length the general observer turned to the physical rather than the chemical condition of the air as the thing which affects the individual. It became recognized that we need movement and change in the air we breathe, just as we need exercise and variety in the food we eat. Dr. Leonard Hill has made some important investigations on these points. He has stated in our columns that the increased percentage of carbonic acid gas and diminution of oxygen which have been found to exist in badly-ventilated enclosures are such that they can have no effect upon the incidence of respiratory disease and the higher death-rate which statistical evidence has shown to exist among persons living in crowded and unventilated rooms. In his view, it is the conditions of temperature, moisture, and stagnant atmosphere in such places which reduce the whole metabolism of the body to a lower plane.

It used to be said that the air of an inhabited room should not contain more than 0·06 per cent. of carbonic acid. It is now demonstrated that when the carbonic acid does not amount to 1 per cent. it does no harm. Not more than 0·4 per cent. is found in the most overcrowded public halls. As for oxygen, we know that men can work and live vigorous healthy lives in the mountainous regions of the earth where the partial pressure of oxygen is only 17 per cent. of an atmosphere or less. Much too much attention has been devoted to the effect produced on the chemical composition of the atmosphere by breathing; whereas the trouble is caused by the exhalations, the dampness and the heat coming from the body, its effects on the clothes worn, and the temperature of the air surrounding the body. The proportion of carbonic acid, not important in itself, may also be noted as a witness of the quantity of fresh air supplied. If the result is not good, it is not reasonable to at once condemn the system employed, whether it be some method of mechanical ventilation or natural ventilation depending merely on the opening of windows. Both these systems may work well or badly according to the way they are applied. In a commercial establishment at New York, for example, where 4000 persons are employed, the building was too hot. There was no fault to find with the system of heating and ventilation, but in its application. The flue that should have carried away the heat from a warming apparatus to a ventilating shaft was not in working order.

METROPOLITAN WATER BOARD'S DEFICIENCY.

The vexed question of the Metropolitan Water Board's deficiency continues to excite discussion among the various Metropolitan Borough Councils.

The Islington Borough Council recently considered a communication from the Hackney Council expressing the opinion that the Board should obtain powers to make such charges over the whole of their area as would ensure that the Board's income would be sufficient to meet their expenditure, without the necessity of levying the deficiency rate. The Islington Council, however, felt that it was not desirable that the Board should be empowered to increase the existing charges for water, but rather that steps should be taken to ensure that any sum required to meet a deficiency in the accounts should be apportioned among all local authorities in the Board's area; and in this expression of opinion the Stepney Borough Council have concurred. The Westminster City Council, on the other hand, consider that the question of the revision of the apportionment of the charges for water supply requires very careful consideration, and do not think it desirable that they should commit themselves to an expression of opinion on the subject at the present time.

Following the abortive conference between the London County Council and Metropolitan Water Board on the same subject [which took place early in May] there appears, therefore, to be little prospect of any definite steps being taken in the matter before the termination of the war.

At the conference here referred to, the arguments for the County Council were put in the main by Mr. Laurence W. S. Rostron. The case for the County Council propounded, as an important matter of principle, that the question of the deficiency in the water fund should be placed upon a proper basis; and among other things it was suggested that the question, in fact, affected the popularity of the Board's stock as an investment and the security of the stockholders. It was urged that, even though the sums apportioned upon the local authorities in respect of individual deficiences might be relatively small, and each annual deficiency in itself of no large amount, yet in the whole these sums attained a considerable aggregate. The deficiencies are, it was urged, likely to go on and increase; and future capital commitments of the Board and the coming into operation in 1923 of the sinking fund on the purchase-money of the undertaking would materially add to the amount. It was also, among other things, pointed out that London had a grievance from the fact that some districts which take the Board's water do not contribute to the deficiency; and the grievance was not removed by the mere fact that if these exempted districts were brought into contribution the amounts apportioned upon them would in many cases be small. The Council further alleged that, in the extra-Metropolitan districts, the valuations of the local Assessments Committees, upon which the water-rates are all charged, are made upon a lower

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tandard than prevails in London, and that this aggravates the London grievance.

Mr. C. G. Musgrave replied on behalf of the Water Board; and he delegates subsequent to the conference placed on record their considered opinion in the following terms: "That the conference with he London County Council on May 7, with respect to the methods of meeting the deficiency in the water fund, did not show that any circumstances had arisen which (*a*) were not contemplated at the time such methods were prescribed by Parliament, or (*b*) would justify the Board in promoting a Bill which could not fail to involve prolonged and expensive proceedings in Parliament arising out of the conflicting opinions and resulting opposition of the local authorities in the Board's area of supply."

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

A meeting of the Edinburgh and Leith Corporations' Gas Commissioners was held last Monday—Lord Provost Inches presiding. The Finance Committee's minutes included a report by the Treasurer (Mr. A. Canning Williams) that the gas revenue collected last year amounted to £266,108—a decrease of £5000. The total sale of gas for the year 1914-15 was 1,988,328,500 cubic feet, a decrease of 30,913,200 cubic feet, or 1·53 per cent., on that of the previous year. The falling-off was more than accounted for by the restricted public lighting, which resulted in a reduction of 31,971,800 cubic feet. During the spring term of 1915 the value of gas sold was £69,445—a decrease of £1933. The total receipts were £360,887—a decrease of £14,595.

At last Monday's meeting of the Edinburgh and Leith Corporations' Gas Commissioners, Bailie Lyon said that the question of an investment in the new war loan at 4½ per cent. had been considered; but they had not got the money. By anticipating, however, certain payments in connection with the superannuation fund, they would be in a position to invest £4000; and he recommended that this should be done. They could also exchange £4000 of stock in the old war loan, which would give them £8000 in the new. In the former loan they had £20,000. The recommendation was agreed to.

The Gas Committee of the Kirkcaldy Town Council, in their financial statement, show a deficit of fully £700 for the past year. They recommend an increase of 1s. per 1000 cubic feet, making the price of gas 4s. 5d. per 1000. This is principally due to the rise in the price of coal, which it is estimated will cost £6000 more than last year. Even with the increased price, it is anticipated that there will be a deficit of some £436.

The difficulty of obtaining men to take the places of those who have joined the Colours has led the Glasgow Corporation Lighting Department to experiment in the employment of women as stair lamplighters in the Eastern, Springburn, and Govan districts. They are to receive at the start the minimum wages of the men.

The illuminating power of the gas was referred to at a meeting of the Dundee Town Council, when Mr. Paton pointed out that, while the power was 17·26 candles at the beginning of May, it was down to 15·14 candles at the end of the month. Mr. Noble (the Convener of the Gas Committee) pointed out that under existing conditions, "it was antiquated to bring up questions of candle power." As a matter of fact, however, it was impossible to get coal to keep it up; and they had to take the best they could obtain.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *July* 5.

Pitch is quiet, as is usual at this season of the year—the present value being 26s. per ton, nominal, in bulk, at makers' works. Creosote is 4⅛d. to 4¼d. per gallon, net, in bulk, at makers' works. Solvent naphtha is in demand at good prices. Benzol is scarce, owing to the Government having largely requisitioned available supplies. Sixty per cent. crude carbolic acid is steady at 3s. 6d. to 3s. 7½d. per gallon, net, casks free; 48-50 per cent. anthracene is 2¼d. per unit, casks free. Sulphate of ammonia continues on the up grade; and the present price for 25 per cent. quality is £14 7s. 6d. per ton, net, at makers' works, bags extra, for delivery to June, 1916.

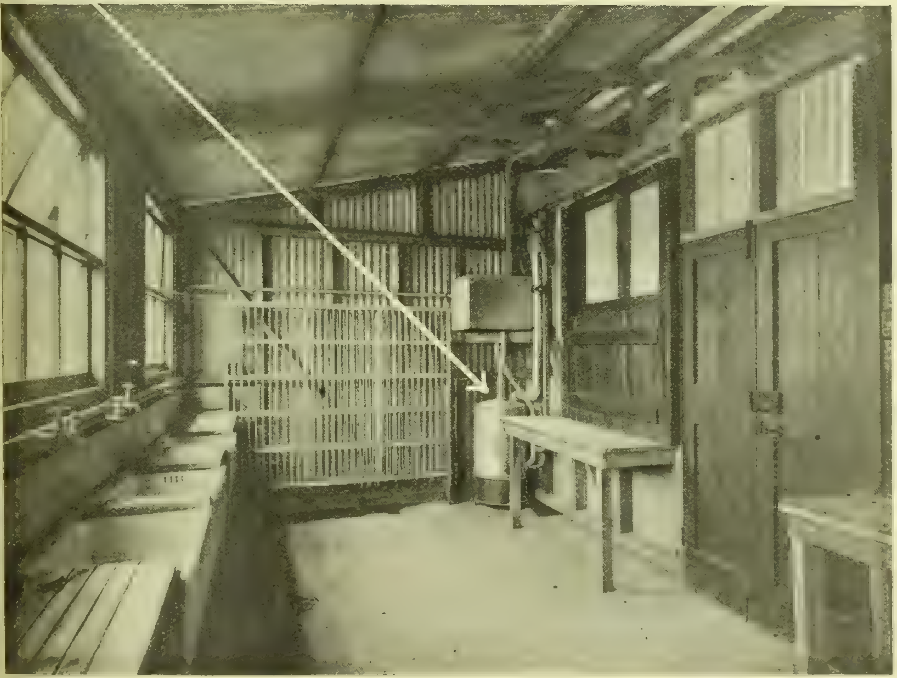
Tar Products in the Provinces.

July 5.

There has been very little fresh business in the markets for tar products during the past week. Distillers maintain their idea in regard to the value of pitch, but no business can be worked for the forward position owing to the uncertainty of freights. Solvent naphtha maintains its price, and is still in very good demand. Creosote is quiet, and there is plenty of the article offering in all quarters. Some business is reported in crude carbolic for this year's delivery at slightly lower prices.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 6d. to 25s. 6d. Pitch, East Coast, 22s. to 23s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. to 24s. Clyde. Benzol, 90 per cent., naked, North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3d. to 3 1/16d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 4d. to 3s. 6d.

THE "ZENITH" GAS-HEATED BOILER



The "Zenith" installed in the corner of a cookhouse of a temporary Military Camp.

The "ZENITH" is a COMBINED HEATER and STORAGE-CYLINDER.

Therefore no heat lost between heater and cylinder.

Constant supply of hot water available at any moment, daytime or night-time.

Made in three sizes, 10, 20, and 40 gallons, each complete with Thermostat.

Manufactured by
ARDEN HILL & CO.,
ACME WORKS,
BIRMINGHAM.

Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *July* 3.

Throughout the week there has still been no sign of any falling off in the demand for this article, the inquiry for shipment to Java being especially large, and once more considerably advanced prices have been obtained in all positions. The nearest values at the close are £14 12s. 6d. per ton f.o.b. Hull, £14 15s. f.o.b. Liverpool, and £15 f.o.b. Leith, for early delivery. For future shipment, £15 per ton at the chief ports has been paid repeatedly for equal monthly quantities from July, 1915, to June, 1916, and in some instances producers are now holding for still more money.

Nitrate of Soda.

The decline in the value of this material has been arrested, and the spot market is now very firm at 12s. per cwt. for ordinary, and 12s. 3d. for refined quality.

Sulphate of Ammonia.

From another source it is reported that this market has remained very firm throughout the past week, and the majority of manufacturers are asking very high prices for forward position. Outside London, makes are quoted at £13 12s. 6d.; Hull, £14 5s.; Liverpool, £14 7s. 6d. to £14 10s.; Leith, £14 10s.; and Middlesbrough, £14 5s. to £14 7s. 6d.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is somewhat quieter; but there is a rather fuller demand for some of the better classes of both steam and gas coals, and for these the prices are well maintained on the whole. In the steam coal trade, best Northumbrians are from 20s. to 20s. 6d. per ton f.o.b.; the supply being well booked for about a fortnight ahead. Second-class steams are offered freely, and may be quoted at about 17s. per ton; while for steam smalls the market seems quiet at from 14s. to 16s. per ton f.o.b. There is a fair output at the collieries when the reduced number of miners is taken into account. In the gas coal trade, the demand is full on the large current contracts, and prices are on the whole steady. Best Durham gas coals are 20s. per ton f.o.b.; for second-class gas coals the current price is from 17s. to 18s. per ton; and "Wear Specials" are in good demand at about 21s. to 21s. 6d. per ton f.o.b. The freight on gas coals is steady at about 7s. 3d. to 7s. 6d. Tyne to London; and tonnage is not over plentiful. There is not much forward business in gas coals being negotiated in this market at the present time; but shipments are heavy in coasting and in some of the French trades. With this month some of the contracts at better prices have come into operation, but additional sales are impeded by the difficulties of transit and possible changes in the prices. Coke is firm, with higher values. Gas coke is scarce through the lessened output. Good gas coke is dearer—from 26s. 6d. to 28s. per ton f.o.b. in the Tyne being the current quotation.

Alleged Gas-Works Nuisance.

Mr. Justice Ross, in the Chancery Division of the High Court of Justice in Ireland, refused an injunction sought by Mr. James Fletcher, hackney carriage owner, &c., of Bangor, co. Down, to restrain the Bangor Urban Council from causing a nuisance by erecting and working at their gas-works of a large retort-house close to plaintiff's premises, and from obstructing certain lights, creating noises, and causing offensive smells and vapours. Defendants traversed the alleged causes of action, and pleaded the Public Authorities Protection Act. His Lordship said he believed plaintiff brought his action honestly, and suggested that defendants might see their way not to ask for costs of the hearing, which occupied four days. The suggestion was agreed to. The Judge then dismissed the action, without costs, on condition that there would be no appeal. In a review of the evidence, his Lordship mentioned that especially of Mr. J. D. Smith, the Manager of the Belfast Gas-Works. Mr. Smith stated that the old system of gas making was an abominable one. The new system, however, was practically perfect; so that it was almost impossible for any dust to get out. The retorts had, no doubt, to be cleaned once a month; but this only occupied from 10 to 15 minutes. If Mr. Smith's evidence was true, his Lordship could not see how inconvenience could be caused by the works in their present state. In black dust substances which had been analyzed materials were found which came mainly from anthracite coal, and not from bituminous coal. In his belief, 90 per cent. of the dust matter complained of came from other sources than the gas-works. No evidence had been produced to show that the Bangor method of gas making was defective; and he was led to the conclusion that it was impossible that a nuisance of the kind described by the plaintiff could have been set up by it.

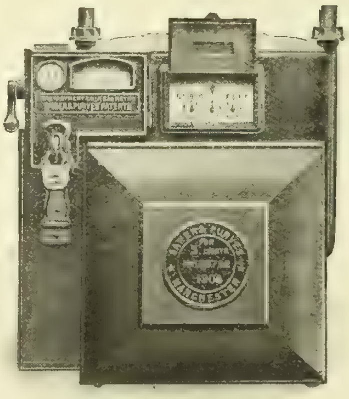
Gainsborough Gas Prices.—A special meeting has been held of the Gainsborough Urban District Council, to consider the best method of meeting an increase in cost of the production of gas for the year of nearly £3000. The opinion of the Gas Committee was that if they ceased to allow discounts, and effected other practicable economies, they would be able to avoid raising the price of gas or coming upon the rates. Some members thought that the price of gas should be increased; but after the matter had been discussed, it was decided to abolish the 12½ per cent. discount hitherto allowed to users of prepayment meters, and 10 per cent. to ordinary consumers.

SAWER AND PURVES

MANUFACTURERS OF PREPAYMENT AND ORDINARY METERS.

Wet or Dry.

FIRST IN 1889.



Any Coin.

FOREMOST IN 1915.

MILES PLATTING,
MANCHESTER.

Wires:
SAWER MANCHESTER.
NOTTINGHAM.

'Phones:
3289 CITY, MANCHESTER.
2025 NOTTINGHAM.

RADFORD ROAD,
NOTTINGHAM.

Yorkshire Price Increases.

The Dewsbury Corporation have confirmed the decision of the Gas ommittee to advance prices by 4d. per 1000 cubic feet for lighting d power purposes, and to establish a charge of 6d. per quarter as nt for automatic meters.—The Batley Town Council last Thursday proved the recommendation of the Gas Committee for an increase gas prices by 6d., making the new rates 3s. 6d. per 1000 cubic feet oss (3s. 1d. net, if paid within a specified time) for lighting, and 3s. oss (2s. 7d. net) for power, and the discontinuance of the discount therto allowed to consumers through automatic meters.—The price gas at Thirsk has been increased from 3s. 8d. to 4s. per 1000 cubic et.—Prices have been increased at Spenborough by 6d. all round.—he Birstall Gas Committee have recommended increases of 3d. per oo cubic feet all round —The Hellifield Gas Company have increased eir price from 4s 6d. to 5s. per 1000 cubic feet, and in slot meters 6 cubic feet will be supplied for 1d. The rent for cookers is also creased. The Parish Council are objecting that the increases are xorbitant.—The Shillington Parish Council have protested against e increase of gas prices by the Ossett Corporation.—The Sowerby ridge Gas Committee propose to advance gas prices by 6d. per 1000 bic feet. The price at present is only 1s. 9d. net.

Porthcawl Gas-Works Purchase.

Last Saturday week the Porthcawl Council finally took over the gas-orks, handing to the Company a cheque for the amount due. The roceedings in connection with the purchase have been long, and any fights have taken place during the period. The Council met ith very great opposition at Porthcawl in the promotion of their heme. Many public meetings were held and an informal poll was ken—the Council being defeated. Again at the statutory meeting of atepayers the Council were defeated on the gas-purchase clause, by a ajority of 32. Not to be denied, the Council demanded a poll by allot, when they converted the adverse vote into a majority of 133 in avour of purchase. Fortunately for the Council, they had arranged or the purchase money before the war broke out. The arbitration roceedings took place in January of this year; and the umpire's ward was for £30,396. It was admitted on all sides that the Council ad obtained the works (which last year made a profit of over £2000) t a very low figure. The Council were successful last week in obtaining the Treasury sanction to the loan; and the money was borrowed t the originally agreed figure of 4½ per cent. for 35 years, or less should oney get cheaper after the termination of the war.

Rather than increase the price of gas by 4d. per 1000 cubic feet meet the increased cost of production, the Ambleside Urban District ouncil have decided to draw on the reserves that have accumulated recent years.

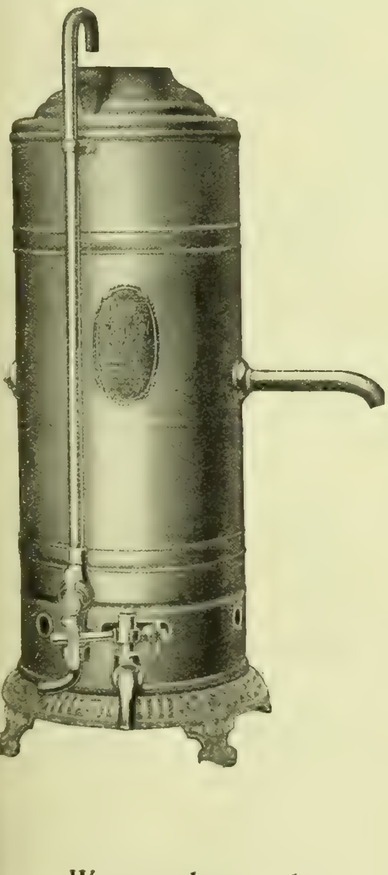
Price Raised at Stourbridge.—At a meeting on Monday of last week, the Stourbridge Urban District Council decided to increase the price of gas 3d. per 1000 cubic feet to private consumers, and 2d. to users for power purposes. The prepayment consumers will receive 24 cubic feet of gas for 1d., which Alderman S. Fiddian (the Chairman of the Gas Committee) pointed out represents a rise of 1¼d. per 1000 cubic feet.

Price Increased at Sheffield.—The Sheffield Gas Company have decided to increase the price of gas 6d. per 1000 cubic feet to all classes of consumers, as from the June reading of the meters. To a representative of a local paper, Mr. Hanbury Thomas pointed out that the amount of the increase is no more than has been found necessary all over the country; but it seems so much more serious to Sheffield consumers because of the extremely low prices at which they have hitherto been supplied. He pointed out that extra costs due to the war were the cause of the increase, which was a great disappointment to him personally.

Hampstead and Reduced Lighting.—At the last meeting of the Hampstead Borough Council, the Town Clerk announced the receipt of a letter from the Commissioner of Police, referring to the occurrence of manifestations of popular opinion in favour of the total extinction of the street lighting when warning is received of an impending attack by hostile aircraft. The letter stated that, after very careful consideration of the matter by the Admiralty, their decision was that such a course was most undesirable. According to expert opinion, the extinction of street lighting would rather aggravate than reduce the degree of danger to which the public are exposed.

Economizing at Pontefract.—At a special meeting, the Pontefract Town Council confirmed, practically in their entirety, recommendations of a Committee appointed to go into the question of employment in the departments of the Corporation, with a view to economy. The Committee suggested that the Clerk of Works at the Roall Water-Works and a similar official employed at the workmen's dwellings should be dispensed with; that the four lamplighters be reduced to two; and that the caretakerships of the various municipal buildings be co-ordinated. Besides these, several labourers and street-sweepers it was recommended should be dispensed with. The total reduction of wages suggested is over £1200 a year—nearly equal to a 6d. rate.

Lytham Gas Undertaking.—At the last meeting of the Lytham District Council, the minutes were approved showing an increase in the price of gas of 3d. per 1000 cubic feet. It was stated that this was due to the greater cost of production. Arising out of the discussion, Mr. W. E. Garlick suggested that it would be well if some information were given regarding the financial side of the undertaking. He noticed an item, in regard to the cost of the new works, of £1023, which appeared as extras and paid for out of revenue. He thought they should know something more definite as to how it was there was no available surplus from the works. The Chairman said a statement could be made at a future meeting upon notice being given. He added that Mr. Garlick had touched upon a vital point.



PRACTICAL EXPERIENCE

shows Managers that the Water Heater which gives the most satisfaction to consumers, costs least to keep in order, and brings no complaints of heavy gas bills is a

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Every Machine embodies the result of OUR practical experience in manufacturing and fitting Geysers over a period of 45 years.

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Incorporating Maughan's Patent Geyser Co.
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We are always pleased to quote for modifications to suit special requirements.

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Water-Works Loan Refused.—The Holywood (co. Down) Urban Council have expressed regret at the decision of the Commissioners of Public Works in Ireland, acting for the Treasury, refusing the loan, already sanctioned by the Irish Local Government Board, for water-works extensions. The Council consider the scheme urgent.

Coventry Water Undertaking.—The past year again proved a successful one for the Coventry Water Department. The accounts for the year ended March 31 show a net profit of £7369, and a disposable balance, after allowing for the amount brought forward from the previous year, of £7753. The Water Committee are recommending that the balance be dealt with as follows: £5000 in relief of the rates, £2000 to an appropriation account in respect of the laying of mains and other special purposes, and the balance of £753 to be carried forward.

Bradford Water Supply.—The Bradford City Treasurer has presented the balance-sheet of the Water Department, showing that the profit on the past year is only £5800, compared with £10,800 in the previous year. The income from the sale of water has decreased by £4100; this falling-off being accounted for entirely by a diminution in consumption since the outbreak of the war. Maintenance costs are £400 less. The Nidd Valley Light Railway, in connection with the water-works, owing to decreased mineral and goods traffic, shows a loss of £2420, as against a previous loss of £1660.

Higher Prices at Ilkeston.—There was considerable opposition at a meeting of the Ilkeston Town Council last Tuesday to a proposal of the Gas Committee to raise the rate charged for gas 6d. per 1000 cubic feet. An amendment moved by Mr. W. Smith, that any increase should be deferred until October, and that the price then should be advanced by only 3½d., was defeated; and the Committee's recommendation bringing the new scale into immediate operation was carried. The Mayor (Mr. J. A. Macdonald), who is Chairman of the Gas Committee, estimated that the increase would probably "see them through" on the year's operations, with a slight profit or slight loss. Fortunately, they were advised last year by the Gas Manager (Mr. J. Exton Holt) to buy coal heavily; and the stock purchased at the reduced rate would probably keep them going until October.

Actual and Estimated Periods of Sickness.—At a meeting in connection with the South Metropolitan Gas Company's Provident Society, the Secretary (Mr. H. Lesser) reported that the sickness experience for 1914 was appreciably better than 1913; and, better still, the length of sickness per member was shorter than had been the case for the last fourteen years. A table which had been prepared showed that health conditions under the Company's co-partnership system are manifestly superior to those on the average elsewhere, as estimated by the Government Actuary. The following are the 1914 figures of the Company, showing the number of weeks' sickness per member for the different ages stated; the Government Actuary's estimated figures of the average period of sickness per member being given in parentheses: 16 to 20 years, 0·51 (0·96); 21 to 25, 0·48 (0·89); 26 to 30, 0·54 (0·95); 31 to 35, 0·82 (1·06); 36 to 40, 0·91 (1·27); 41 to 45, 1·39 (1·58); 46 to 50, 1·45 (1·99); 51 to 55, 1·71 (2·76); 56 to 60, 2·29 (4·05); 61 to 65, 2·46 (6·44); 66 to 69, 5·35 (10·86).

Biddulph Gas Undertaking.—An exhibition of gas appliances has been held in the Public Hall, Biddulph, and was kept open for four days. Mr. A. Findlow, who performed the opening ceremony, remarked that by advertising the advantages of gas cookers, fires, &c., the Council hoped to increase the number of consumers. Practical support was necessary to render the Council's undertaking a success; and this meant an increased consumption. The scheme had met with strong opposition from the outset; and technical difficulties were encountered. These, however, were being gradually overcome. The war had also, to some extent, hampered the completion of the scheme, owing to the curtailment of the Council's borrowing powers by the Local Government Board; and this would probably delay the laying of the mains to the outside districts for some little time. Street lighting had been commenced; and the Council had already reduced the price of gas to 4s. 6d. per 1000 cubic feet, with a discount of 5 per cent. for prompt payment. The extensions of the gas-works would meet an increased consumption of several million cubic feet of gas. He looked forward with confidence to the time when the gas-works would prove, not a "white elephant," but a valuable asset, and a means of relieving the overburdened rates of the parish.

GAS COMPANIES IN THE STOCK EXCHANGE.

Last week, as in the week before, the War Loan was again the autocrat of the Stock Exchange, and markets in general had to bow to its behests. It is gratifying to be assured, from all quarters which ought to know, that the Loan's progress is such as to indicate a complete success in result; but meanwhile other important things are being crushed beneath its wheels. Pressure to realize other securities in order to take up the Loan made it at times difficult to deal at all; but towards the close there was some relief. Prices, of course, have tumbled all to pieces—in some lines they are hardly recognizable. New regulations affecting the Loan continue to come out. Last week it was a Bill to enable trustees to borrow so as to take up Loan—a forward step which has aroused misgivings as to its soundness in the minds of some; and a Bank of England memorandum has defined that the rights of conversions of Old Loan and Consols are inseparable from the holding of the New Loan. Within the Exchange a movement was started to petition the Committee to close at two o'clock; but it does not seem to have met with strong support. Business in the Gas Market showed some increase in volume over the meagre figures of the week before. Prices were uneven. Some issues were fairly firm; but in the majority of cases the general dislocation of markets influenced a fall. The Money Market was very easy for short loans, but discount rates hardened.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 83¾, 84, 84¼, ditto debenture 59½, 60, Imperial Continental, 60, 60½. On Tuesday, European 14¼, 14½, 14¾, Gas Light ordinary 83½, 84, Liverpool 100½, Oriental 106, South Metropolitan debenture 60. On Wednesday, Bombay 5, Gas Light ordinary 83½, 83⅞, 84, Imperial Continental 60, River Plate 75, South Metropolitan 89, ditto debenture 55. On Thursday, Continental Union 39½, 40, Gas Light ordinary 83½, 84, ditto debenture 60, 60½, Hastings 5 per cent. 103½, Imperial Continental 52½, 53, Primitiva 2¾. On Friday, Commercial 4 per cent. 92, Gas Light ordinary 82, 82¼, 82½, 83, 83⅛, 83½, 84, ditto preference 77⅝, 78, Imperial Continental 54½, 55, 56, Primitiva preference 3⅝. On Saturday, Gas Light ordinary 82, 82½, 83, 83½, ditto maximum 67, ditto preference 77½, 78, South Metropolitan 90.

Bank rate (fixed Aug. 8), 5 per cent.; last year, 3 per cent.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING JULY 3.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	..
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7½	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	5
50,000	10	Feb. 26	16	Bournemouth Gas and Water 10 p.c. . .	29—30	5 6 8	..
873,480	10	,,	7	B 7 p.c. .	15—15½	4 10 4	..
95,000	10	,,	6	Pref. 6 p.c.	13½—14	4 5 9	..
—	—	—	—	Deb. . .	..	—	..
380,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
330,000	,,	,,	11	Do. New . . .	204—209	5 5 3	..
50,000	,,	,,	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	91—93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	,,	,,	8	Do. A Ord. Stk. .	154—159	5 0 8	..
530,000	20	Mar. 26	12½	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	Do. 4½ p.c. Pref. .	4—6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	92
560,000	,,	,,	5¼	Do. 3½ p.c. do. .	103—105	5 1 6	..
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	..
800,000	Stk.	,,	4	Continental Union, Ltd.	76—79	5 1 3	39½—40
200,000	,,	,,	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	Derby Con. Stk. . . .	123—125	4 16 0	..
55,000	,,	—	4	Do. Deb. Stk. .	102—104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd. . . .	17½—18	5 11 1	14¼—14¾
16,362,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke 4 p.c. Ord. . .	98—102	4 15 6	82—84¼
2,600,000	,,	,,	3½	3½ p.c. max. .	76—79	4 8 7	67
4,062,235	,,	,,	4	4 p.c. Con. Pref.	96—99	4 0 10	77½—78
4,674,850	,,	June 11	3	3 p.c. Con. Deb.	72½—74½	4 0 6	59½—60½
130,000	,,	,,	10	10 p.c. Bonds .	..	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16½—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c. . . .	..	—	..
131,000	Stk.	Mar. 12	7⅞	Ilford A and C . . .	151—154	5 2 4	..
65,780	,,	,,	6⅝	Do. B	115—118	5 8 0	..
65,500	,,	June 26	4	Do. 4 p.c. Deb. . .	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental .	150—160	5 12 6	52½—60½
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c. .	119—121	5 7 5	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. A	211—213	4 13 11	100½
718,100	,,	,,	7	B	146—14	4 14 7	
306,083	,,	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	—
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	.
541,920	20	May 28	4	Monte Video, Ltd. . .	11½—12	6 13 4	.
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	98½—99½	4 10 6	..
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	.
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	.
300,000	Stk.	May 14	8	Oriental, Ltd. . . .	117—122	6 11 2	10
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .	7¼—7¾	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B . .	128—131	4 19 3	..
100,000	50	,,	12	Do. C . .	118—121	4 19 2	..
52,000	50	,,	10	Do. D . .	..	—	.
249,980	5	April 29	8	Primitiva Ord. . . .	5½—6	6 13 4	2
499,960	5	June 26	5	,, 5 p.c. Pref. .	4¾—5	5 0 0	3
521,600	100	June 2	4	,, 4 p.c. Deb. .	91—93	4 6 0	..
—	—	—	—	,, ,, ,, 1911	..	—	..
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	7
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	5 p.c. Deb.	47—49	5 2 0	.
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 8	..
209,984	,,	,,	10	Do. B	222—224	4 9 8	..
523,500	,,	,,	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African . . .	10½—11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	8
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	5
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	..
60,000	,,	,,	5	Do. 5 p.c. Pref. .	110—112	4 9 3	..
—	—	—	—	Do. West Kent. .	..	—	..
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord. . .	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c. .	135—138	5 8 8	..
742,275	,,	,,	6†	B 3½ p.c. .	115—117	5 2 7	..
181,255	,,	June 26	4	4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	,,	,,	6⅞	,, B 3½ p.c.	129—134	5 2 7	..
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110—115	5 2 0	..
352,000	,,	,,	6⅛	Wimbledon 5 p.c. .	117—122	5 0 5	..
98,000	,,	,,	6⅜	Epsom 5 p.c. . . .	121—126	5 5 2	..
88,416	,,	June 26	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

Price of Gas at Haverhill.—In a report submitted to the Haverill Urban District Council, the Gas Committee stated that they had ad under consideration the question of the price of gas, and had ecided to defer for the present consideration of the matter.

Wages Demands Refused at Darwen.—The General Purposes Comittee of the Darwen Corporation have now considered the report of he Sub-Committee who had met representatives of the Gas-Workers' Jnion with reference to the applications of the employees for increased vages. They decided to recommend the Council to adhere to their revious decision not to grant advances to any employees during the eriod of the war.

The City of London Gas Examiner.—At the meeting of the City Corporation last Thursday, the result was announced of a ballot taken o decide upon the petition of Professor Vivian B. Lewes for an inrease of salary. The Committee's recommendation was that the salary hould be increased from £400 to £500 per annum as from Lady Day. There voted 78 for the affirmative and 68 for the negative. Professor Lewes therefore secures the advance.

Dearer Coal Advances Marple Gas Prices.—The Marple Urban District Council recently issued to consumers a provisional notice of heir intention to increase the gas charges to all classes of consumers 6d. per 1000 cubic feet, such increase to take effect from the June quarterly meter-readings. It was found, however, on the renewal of he coal contracts [at prices which proved to be 6s. per ton higher han last year, whereas the 6d. advance only allowed for 5s. per ton ncrease], that a further increase of 1d. would have to be made; and an amended notice has now been issued to consumers showing an ncrease of 7d. per 1000 cubic feet.

Blackburn Water Engineership.—The printed minutes of the General Purposes Committee of the Blackburn Corporation contained a report by the Sub-Committee appointed to consider the question of he vacancy caused by the retirement of Mr. W. Stubbs, the Borough and Water Engineer. They recommended: (1) That the position coninue to be the dual position of Borough and Water Engineer; (2) that an advertisement be issued inviting applications for the position at the commencing salary of £700 per annum, canvassing not to be allowed, but copies of applications permitted to be sent to members of he Committee; (3) that the definition of duties of the position already n existence be confirmed. The report was referred back to the Sub-Committee for further consideration.

Oldham War Bonus Decision Re-affirmed.—A Special Committee of the Oldham Town Council met last Thursday to further consider the application of the Corporation employees (including those engaged in the Gas and Water Departments) for a war bonus. The meeting was called in response to a request of Mr. J. R. Clynes, M.P., General Secretary of the Gas-Workers' Union. The Committee re-affirmed their previous decision not to recommend the Council to grant war bonuses. The application had previously been refused on the grounds that the men, who were in steady employment, and were in better circumstances than many ratepayers who would be called upon to bear the extra expense.

The Cambridge University and Town Gas Company are increasing the price of gas to 3s. per 1000 cubic feet.

While waiting for a jug of water to fill up a water-slide chandelier, Mrs. Brassington, of Alsager, incautiously lit a match. As a consequence, she was badly burned about the face and arms, while the house and its contents suffered material damage.

The Kildwick Parish Gas Company have advanced the price of gas for lighting from 2s. 11d. to 3s. 4d. net per 1000 cubic feet. For heating and cooking purposes also, the price has been raised to 3s. 4d. (returning to a former figure, after several reductions in recent times), and 2½d. discount is to be allowed.

The employees of the Tottenham District Light, Heat, and Power Company have been informed that they are to receive increased bonuses. Hitherto employees earning up to 30s per week have had an extra 3s.; and those earning more, 2s. Now the bonuses are to be 4s. and 3s. respectively. Boys under 18 years of age, who have not hitherto been paid anything extra, are to get 1s. 6d. per week. The staff with salaries up to £160 per annum have been receiving 5 to 7 per cent. increase; and the maximum is to be extended to £200 a year.

The Spenborough Council propose to reduce the staff at the gas-works. Representatives of the Gas-Workers Union were permitted to visit the works to form a judgment, on behalf of the men, as to whether the Union could agree to the proposed reduction, and had reported that they could not agree, but promised to lay before the men any other proposals the Committee might bring forward. After further consideration, the Committee decided to give a fortnight's trial to work by a reduced staff, and to submit this proposal to the men.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Gas Engineer and Manager. Abertillery Urban District Council. Tenders by July 17.
Draughtsman. Drakes Limited, Halifax.
Engineer and Manager. Salisbury Gas Company. Applications by July 19.
Works Foreman. No. 6060.
Carbonizing Foreman. No. 6061.
Carbonizing Foreman. No. 6062.
Gas Works Fitter. No. 6063.
Stokers. Ulverston Gas and Water Works.

Plant, &c. (Second Hand), for Sale.

Manual Charging Machines. Weston-super-Mare Gas Company.

Patent Licence.

Atmospheric Gas-Burners. Browne and Co., Warwick Court, Holborn.

TENDERS FOR

Coal.

Newbury Gas Department. Tenders by July 12.

General Stores (Flexible Tube, Lead Pipe, Main Taps, Fire Cement, Vitriol, &c.).

Northwich Gas Company. Tenders by July 10.

Mantles.

Northwich Gas Company. Tenders by July 10.

Pipes, &c.

Northwich Gas Company. Tenders by July 10.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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All Communications, Remittances, &c., to be addressed to
Walter King, 11, Bolt Court, Fleet Street, London, E.C.

Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

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LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
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THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, May 11, p. 314.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, Oldham, and 45 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
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Telephones: 815 Oldham, and 2412 Hop, London.
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Tins for sale to Consumers.
In Bulk for Works Use.
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Telephone: 1588 Avenue (3 lines).

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GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.

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TAR WANTED.

THE Burnden Tar Company (Bolton), Ld.
Hulton Chemical Works, BOLTON.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

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"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.

It is also used for the Enrichment of Gas.

Manufactured and Supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agents, F. J. Nicol & Co., Pilgrim House, Newcastle-on-Tyne.

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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

CHEMIST.

APPLICANTS for the above Post, ad- vertised under No. 6035, "Gas Journal" Offices, are THANKED, and Informed that THOSE PERSONS WHO HAVE NOT BEEN COMMUNICATED WITH ARE NOT ONE OF THE SELECTED CANDIDATES.

BOROUGH OF DROITWICH.
(Gas Department.)

APPLICANTS for the Post of Engineer AND MANAGER are THANKED FOR THEIR APPLICATIONS, and are Informed that the APPOINTMENT HAS BEEN FILLED.

S. J. Tombs,
Town Clerk.

Town Hall, Droitwich,
June 30, 1915.

ABERTILLERY URBAN DISTRICT COUNCIL.

APPOINTMENT OF GAS ENGINEER AND MANAGER.

THE Council invite Applications for the Position of ENGINEER and MANAGER of their Gas Undertaking. Preference will be given to Candidates with Experience in Carburetted Water Gas and Sulphate of Ammonia Manufacture.

Salary, £250 per Annum. Coal and Gas.

Applications, stating Age, Qualifications, and Experience, together with *copies* of not more than Three recent Testimonials and endorsed "Gas Engineer," to be sent to the undersigned not later than Saturday, the 17th of July, 1915.

Canvassing, Directly or Indirectly, will be regarded as a Disqualification.

William Gait,
Clerk to the Council.

Council Offices, Abertillery,
Mon., June 30, 1915.

WANTED—a Reliable Draughtsman, with Experience in Structural Steelwork and Gas-Works Plant.

Apply, by letter, to Drakes Limited, Halifax.

WANTED, by a Gas-Works in the South of England making about 170 Millions, a WORKS FOREMAN. Must be thoroughly Reliable and well able to Control Workmen. Experience as a Carbonizing Foreman on Regenerator Settings essential. House, Fuel, Light, Rates, and Water free.

Apply, stating Wages required, Age, and Full Particulars of Experience, with *copies* of Testimonials, to No. 6060, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

CARBONIZING FOREMAN.

GAS Company making about 350 Millions require an Experienced FOREMAN to Take Charge of Carbonizing. Must be used to Machine Stoking and Regulation of Heats.

Apply, by letter, stating Age, Experience, and Salary required, to No. 6061, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

CARBONIZING FOREMAN.

WANTED—by a Gas Company in the West of England making about 220 Millions, a CARBONIZING FOREMAN. Must be thoroughly Reliable, and Able to Control Workmen. Experience with Regenerator Settings and Carburetted Water-Gas Manufacture essential.

Apply, by letter, stating Particulars of Experience, with *copies* of Testimonials, to No. 6062, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GAS-WORKS FITTER.

WANTED—by a Gas Company in the West of England making about 220 Millions, a Good All-Round WORKS FITTER, accustomed to the Erection of Retort-House Ironwork, Gas, Steam, and Water Pipes. One with a knowledge of Engines, Exhausters, and Smithing preferred.

Applications, by letter, stating Age, Wages required, and accompanied with Reference, should be addressed to No. 6063, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

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WANTED—Two Good Shovel Char- GERS for a Works making 65 Millions. Twelve-Hour Shifts—7½ and 6½ alternately. Wages, 5s. 9d. per Shift. Accustomed to Regenerative Settings. One Week's Holiday and Pay per Year. Permanent Situation to Reliable Men.

Apply to the Manager, Gas and Water Works, Ulverston.

SALISBURY GAS LIGHT AND COKE COMPANY.

THE above Company invite Applica- TIONS for the Post of MANAGER and ENGINEER of the above Company (160 Million Cubic Feet), acquainted with Oil-Gas Plant, Tar Dehydrating Plant, and Aldridge and Ranken's Electrically Driven Charging Machinery.

Salary, £400 per Annum.

Applications, endorsed "Gas Manager," and accompanied by *copies* of not more than Three Testimonials, must be received by me not later than the 19th of July, 1915.

Arthur Whitehead,
Secretary.

Salisbury, July 5, 1915.

INDUSTRIAL Gas Appliances—Tech- NICAL SALESMAN Wanted by Large Manufacturing Firm. Must have sound knowledge of the Application of Gas to Industrial Processes.

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NORTHWICH GAS COMPANY.

THE Directors of the above Company invite TENDERS for the undermentioned GOODS as may be required during the Year ending June 30, 1916.

1.—FLEXIBLE TUBE.
2.—LEAD PIPE.
3.—WROUGHT-IRON TUBES and FITTINGS.
4.—MAIN TAPS, &c.
5.—FIRE CEMENT.
6.—MANTLES.
7.—VITRIOL.

Further Particulars and Form of Tender may be had on Application to the Engineer and Manager, Mr. J. A. Brentnall.

Tenders, endorsed "Tenders for ——," and addressed to the Chairman, must be Delivered on or before Saturday, July 10, 1915.

By order,
P. S. Welbourn,
Secretary.

BOROUGH OF NEWBURY.
(Gas Department.)

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the Supply of about 6000 Tons of Screened or Unscreened GAS COAL or NUTS, to be Delivered at Newbury, Great Western Railway, during the Year ending June 30, 1916.

Sealed Tenders, endorsed "Tenders for Coal," and addressed to the Chairman of the Gas Committee, Gas-Works, Newbury, are to be sent in by the 12th of July.

The Gas Committee do not bind themselves to accept the lowest or any Tender.

Tender Forms from the undersigned.

W. R. Davey,
Manager.

Gas-Works, Newbury.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. Richards, at 37, Walbrook, E.C.

THE Proprietor of Letters Patent No. 9610, of 1911, for "IMPROVEMENTS IN AND RELATING TO ATMOSPHERIC GAS AND LIKE BURNERS," is Desirous of entering into arrangements, by way of a LICENCE or otherwise, upon Reasonable Terms, for the purpose of EXPLOITING the above Patent and ensuring its Practical Working in Great Britain. All Communications should be addressed to Browne and Co., Patent Agents, 9, Warwick Court, Holborn, London.

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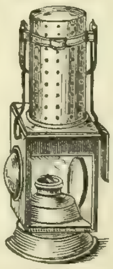
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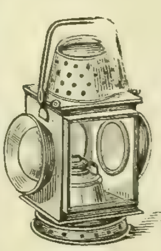
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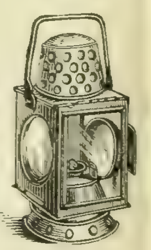
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34, Manchester Street, Gray's Inn Road, W.C.

JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXXI., No. 2722.] TUESDAY, JULY 13, 1915. [67TH YEAR.

EDITORIAL NOTES.

The Coal Situation and Regulation.

"STATUS QUO" succinctly and correctly describes the coal situation. The colliery owners—those who have been thriving well on opportunity—are quite persuaded now that the Government are determined to apply regulation to coal transactions during the remaining period of the war. Consequently, they are on tenter-hooks; and Mr. Runciman is making it worse for them by keeping them there while negotiations run their slow course. Though negotiations may not lead to any amicable understanding, the Government are fully resolved that nothing shall be left undone to prevent the country being crippled by high coal prices and insufficient supplies during the war. Compulsion must follow if negotiations for a pacific and specific end fail.

There are coalowners who look upon the gas industry as having been foremost in the attack upon a monstrous position, which position imperilled public supplies and industries last winter, and brought upon several industries a load of anxiety and expense (the latter of which has had to be transferred to their customers). This was largely due —apart from the shipping and freightage difficulties—to an asserted insufficiency of coal for contracts; yet all were able to keep full running by buying in the open market at exorbitant prices. Now there are those among the coalowners who would like to retaliate on the gas industry for having taken the lead in the patriotic movement against unpatriotism. Last week, on p. 14, we referred to the loose statements of Sir Joseph Walton, M.P., as to the position of gas undertakings in connection with the coal question. Looseness has descended to absurdity; for Sir Joseph has asked the President of the Board of Trade whether, in view of the fact that gas companies are obtaining cheaper coal owing to State intervention, he will take steps, by legislation or otherwise, to bring about a corresponding reduction in the price of coke, toluol, and other residual products, as well as in the price of gas to the consumers. If Sir Joseph knows the prices to be paid for coal under new contracts, and compares them with the contract prices for the past ten years, he will find the task a somewhat awkward one to try to substantiate the assertion as to the companies having already obtained cheaper coal by State intervention. Cheaper than when? As to the reduction in the prices of residuals and of gas, Mr. Runciman gave his interrogator a proper answer, which showed him that gas companies are, unlike the coalowners, already under regulation in respect of charges and profits through the operation of the sliding-scale. Therefore, the President informed Sir Joseph that he did not think legislation in the direction suggested was necessary. There was cold comfort in this; and Sir Joseph doubtless withdrew to ponder over the curiosity of one public supply industry being under regulation while the industry to which he belongs has suffered no such restriction, but has been allowed the fullest liberties in its dealings. It does not matter in the least, in the case of gas companies under the sliding-scale, how high the receipts for residuals or how low the price of coal, the public, under the system of statutory regulation, gets the greatest pull from surplus profits, and the shareholders a very lean part. When the coalowners seriously consider the character of the regulation in the gas industry, we can understand some of them being a little nervous about regulation in the coal industry. They are now waiting to learn what representatives of the Government will have to say to them when the conference of coalowners and miners with these representatives takes place in London on the 21st inst.

Of course, the delay in coming to a decision on the matter of coal prices is disadvantageous to those who are wishful to make their annual contracts; while it is, in one sense, an advantage to the coalowners, as it extends the period during which coal-using undertakings will be compelled to settle their contracts. At the same time, the coalowners are not altogether certain as to what will happen in regard to contracts made this year prior to Government regulation—that is to say, as to whether or not the regulation will be made retrospective. There is, of course, an obvious danger in pressing for a retrospective regulation of price, in that some of the earlier contracts that were made were signed and sealed before the heaviest rise took place at the pithead. If the high increases are lowered to a given level, will the low increases be raised to the same level? Those who are pressing for regulation being retrospective, however, give an alternative; and it is that, if retrospective regulation is found to be impossible, the Government should consider the advisability of taxing collieries to the extent to which the extra price charged has exceeded 4s. 3d. per ton, or such other sum as may be the prescribed limit, over and above the average pithead prices for substantial quantities during the twelve months preceding the war. Much information on these and other matters—such as the question of the regulation of freights and exports—has been given in the "JOURNAL" recently; and it has been summarized in the course of a circular-letter addressed to the members of the Institution of Gas Engineers, and bearing the signature of the President (Mr. John Young).

Technical Truths and Power Trading.

WITHIN the past twelve months, there have appeared in our columns from a gas engineering correspondent and from Mr. E. W. L. Nicol, Engineer to the London Coke Sales Committee, articles of considerable technical value relating to the commercial subject of the sale and use of coke for steam-raising; and now studies, upon practically the same lines, of the question of power production in relation to the competition between gas and electricity are appearing in our columns from the pen of Mr. H. C. Widlake, of the Plymouth and Stonehouse Gas Company. We are afraid that in the gas industry, generally speaking, technical consideration has been largely concentrated upon the production of gas, and that the gas manufacturer has given comparatively little attention to the technical side of the utilization of his primary product. To-day the vending of gas is not merely a commercial matter, but it has a very large technical side; and the more this is recognized and studied, and brought to bear, the greater will be the advantage. With competition assailing and strenuous on every side, the technical aspects and actualities of the use of gas cannot, and must not, any longer be dissociated from the commercial work of the industry. Otherwise the position in future will be anything but a pleasant one for those upon whom rests the responsibility of success in gas trading.

One of the lessons of the terrible war is that this country, and for the matter of that those of our Allies, too, were very ill-informed as to what Germany had been doing in preparing for a great international conflict, and preparing in such a way that for months it has been able to breathe defiance to all the nations who have combined against it. It has likewise been made perfectly plain that, while the arch-enemy has been making the utmost use of science and its resources in meeting the conditions of modern warfare, this country has been, on the military site, sitting indolently by, and allowing traditional methods to largely prevail. Only after a great expenditure of life and money, this country, at a cost which will for generations weigh upon it, is doing its utmost to retrieve the past neglect. It has been a rude awakening. The position on a smaller scale has its example in connection with the gas industry; but it is hoped that the gas industry will take proper heed and promptly alter the conditions. It is not a nice thing to be told, but it is true—and it is not an uncommon thing for truth to be unpalatable —that the gas industry has itself largely to thank for the excellent place the electrical people have won in respect of power. The excellence of the achievement need not have been so great. "We have absolutely," says Mr. Widlake, "played into the hands of our electrical opponents by indulging in the foolish policy of underrating a powerful "enemy which, to the uninitiated, certainly has many superficial points of recommendation." We cannot deny that the electric-motor has its special purposes; our own use of it in the operations of gas manufacture attests the fact. But it is true there are comparatively few gas men who really know the electric-motor inside and outside, who thoroughly know its limits, and who can fairly and squarely put it in comparison on all points with the gas-engine. There is a very positive deficiency in the technical information brought to bear upon the competition; the postulation of the contractors for electric-motors being largely met by a simple negation, which is not good enough for the manufacturer who wants to know the truth concerning all factors contributing to the ultimate issue in "*£ s. d.*"

To get at the technical root of the essential matters, and to make use of the knowledge, mean much in the defence of present, and progress in new, business. The articles by Mr. Widlake will greatly assist to this end; but it will be found that they are penned for something more than casual reading, and deserve indeed minute study—a study which will give possession of many facts and figures concerning the competitive points on the side of the gas-engine, and bring about an acquaintance with data of importance in connection with the electric-motor. The gas engineer must not only be in the position to say that, in cases where the electric-motor is not specially serviceable, the gas-engine has the pull in point of cost, but he must have a full grasp of the "economic and technical possibilities of the electric-"motor," and so be able to "equate these possibilities in "terms which will appeal to business men." Generalities have had their day in this power business; and the gas industry will be all the stronger for getting behind the hypothesis with which the electric-motor has been pushed into more extended use than would have been possible had the resistance been of a stronger order than that which was offered—stronger by being technically fortified. What has been neglected in the past in this regard should be amended now for the benefit of the industry in the future. Gas men must know that there has been a weakness in this competition; and this is not going to right itself by simply making use (after the manner of the competitor) of postulation and assumption. Nor is it wise to encourage the belief that the harm that has been done the electric-motor by the absurd claims made on its behalf will be an effective obstacle to future power competition. Credulity in matters such as this largely obtains among men who have no technical knowledge of the essentials to guide their judgment; and this credulity can only be dealt with by stating the technical case which ends up in an over-all economy and reliability for the gas-engine driven by town gas.

The arguments electrically used in the competition are in our contributors' articles dealt with separately and categorically; and it is shown that, given a good make of gas-engine within the range of commonly used sizes, there is nothing that actually matters in the eyes of the business man that is not favourable to the gas-driven machine. As to larger sizes—more especially the vertical multi-cylindered engines—they have been brought to such a pitch of perfection that there is nothing about them but what is favourable to their adoption in factories, and for use in the generation of electrical energy, which can be done cheaply for all purposes. If gas power is used in a factory equipped with electric-lighting fittings, and the owner desires to continue this system of lighting, he can easily run a small dynamo from the shafting, and supply himself with the necessary current at a much cheaper rate than is possible by local electricity purveyors. Then in reference to the cost comparisons of gas and electric power as presented by the tables in the articles, there may be some criticism of the prices taken by Mr. Widlake, of 1s. 4d. per 1000 cubic feet of gas and 1½d. per unit of electricity. But these are charges that have existence; and the workings are given in such form that calculations can be made—adopting the other valuable cost elements in the tables—to suit any set of local conditions, in order to ascertain total working costs. The stock arguments for electric-motors are also individually treated to technical examination, and are disposed of in a practical manner.

If the gas industry intends properly to push the power business, a larger efficiency must be shown in the methods of doing so. Technical ability and persistence must be brought to bear; and the issues between the competitors must be dealt with in a clear and decisive manner. Beyond the question of meeting electrical competition by methods worthy of the industry, Mr. Widlake shows that there is a tremendous field occupied by the steam-engine (particularly of the small powers) within which town-gas purveyors may operate for an expansion of their business. The whole subject is one calling for more than superficial consideration.

Inauspicious Times for New Engineers.

ANYONE who scans the personal paragraphs that have appeared in the "JOURNAL" the last year or two, will observe that there have been, during that period, a fairly large number of changes in the management of gas undertakings; and that, in not a few cases, the responsibility of full management has been taken up by some of the younger members of the profession who have had the advantage of training under modern conditions, and from whom much is expected. All the training, all the experience, and all the ability which they can command would, in the changed circumstances of ordinary times, be required of them to achieve success. This is a point which we made long before war was ever thought about; but what was true then has been intensified manyfold by the subsequent happenings. We feel a considerable amount of sympathy for these younger men of the profession, who have been, right at the opening of their taking up the responsibilities of the chief executive office, obsessed by a state of affairs that opposes, in almost every direction, a good showing for their work. If fresh capital is required, if the sanction of the Treasury can be secured for its issue, if the public will take it up, it is dearer capital, and so much the worse for the new chief official. Structural materials are all more expensive. Coal, oil, and other materials required in the manufacturing processes are more costly, though the same amount of product can only be obtained from them; labour is dearer; there are obligations attaching to revenue on account of the men who have gone to the front and of their dependants; the imperial and local exchequers need larger contributions, and the conditions of working are not on the most economical lines. In short, there is an increase of expense all round; and yet the circumstances of working and of business are not those that conduce to the highest standards of economy and progress. On the one hand, skilled labour has been greatly curtailed. On the other hand, reduced street and shop lighting have diminished consumption; and people are advised to be in their domestic life more economical in every way.

There are more than sufficient grounds in all this for sympathy with new engineers and managers who have taken up a position in a strange place under new boards or committees, and who are animated by the keenest desire to make a success of the operations under their control. But whichever way they turn they are faced with hostile barriers set up by the conditions that are irremediable and insuperable, until the chaos of war is ended, and then for long only partially. It is regrettable, but nevertheless it is patent to every qualified observer, that there are some boards of directors who think of little else than the financial outcome of the working of an undertaking, and judge an engineer and manager solely on the presentment of the balance-sheet. But even such directors cannot be oblivious to the fact that engineers cannot work miracles, and produce fine balance-sheets under excessive claims upon revenue. We, however, are glad to know that the majority of boards of gas directors (though probably not possessing any members technically trained in gas affairs) are business men, who will recognize that no engineer, whether he be old or new, can produce a rosy condition of things under the working and commercial impediments of the present time. The pity of it is that—every portent is a confirmation—it cannot be expected for many years after the war there will be complete release from the retarding conditions produced by dearer capital, materials, labour, and other financial obligations; so that the new man stands relatively a very poor chance of making the balance of profit bear the same appearance as did his predecessor.

There is one thing, nevertheless, of which we may all be sure, and it is that no energy will be spared on the part of the new chief executive officers to lighten the adverse effects as much as possible; and while there is good energetic management and high working efficiency displayed, intelligent and not grabbing boards of directors and committees will look generously on what their new engineers nd managers are doing, and not judge them from the standpoint of results preceding their entry into office, when things han their normal course, or were only subject, in one or more parts of the business, to the ordinary vagarious movements of commercial life. There will be no opportunity for comparative judgment for some time to come; and in the little world of each gas undertaking, under new technical and ommercial management, no one will regret this more than he man whose primary object is to show by his work that he is worthy of the selection and trust of his directors or committee. This very ambition is the best of assurances to directors and committees that they may rely upon their new chief officers doing their very best—now and hereafter—to mitigate the influences and effects of the extraordinary combination of adverse circumstances.

Trench Work—at Home.

The paper which Mr. Reginald Brown read at the recent meeting of the Institution of Municipal and County Engineers, and which was noticed, with the discussion, in the "Journal" last week, is one which touches upon a subject that has become a vexed one between road authorities and public enterprises using the subsoil of the roadways; and it really constitutes a challenge to the latter to give a better finish to the refilling work on making road openings. County and other road authorities have been very persistent of late years in trying to secure from promoters of Bills and from Parliament additional powers of regulation and charge in connection with pipe work—most of them unduly burdensome, inequitable, and altogether unnecessary. Parliament has observed these characteristics; and, if promoters of Bills are not extraordinarily pliant, and themselves give way, the Legislature has been unwilling to confer upon road authorities more than they have a right to under existing general legislation, other than perhaps in the matter of minor details. What, however, Mr. Brown set out to consider is how best the relations of pipe owners and road authorities can be improved in the matter of increasing the efficiency of the work of reinstatement and maintenance after pipe laying.

Let us preface comment with the remark that the owners of subterranean pipes are quite willing to enter into any arrangements with the road authorities which will be to their mutual advantage, but would strongly resent additional expense being put upon them—that is, expense beyond what they at present incur—unless it is shown they are going to derive compensatory advantage from it. Certain of the proposals put forward by Mr. Brown would mean additional expense to the undertakings concerned; but it might be that no commensurate advantage would accrue to the undertakings concerned. Were Mr. Brown's proposals voluntarily adopted by gas and water undertakings, it would only be by conditions accompanying which would apply to the road authorities themselves. He suggests that road authorities should supervise all openings; the companies to pay the costs of supervision, and be relieved of any maintenance. This would be a question of terms. Local authorities may supervise if they like; but if they desire to do so, they must pay for it—unless there be a *quid pro quo*. What is offered is relief from maintenance; and this would be worth consideration, when the terms are named. These terms would have to include, in definite manner, something more than maintenance by the road authority. We take it that maintenance would embrace reinstatement of the surface; and this would have to carry with it liability on the part of the road authority for any damage for injuries that might arise through delay in executing the work. This question was raised last year in a case in which the Commercial Gas Company were the unfortunate defendants; and last session the opportunity was taken to provide covering legislation in the Liverpool Gas Company's Act and the Riddings District Gas Company's Act. Under the powers then obtained, the two Companies are authorized, in the event of the road authorities not exercising reasonable despatch in reinstating the surface of roadways after pipe laying, to carry out the work themselves, and then refuse payment to the road authority, or, alternatively, if there is delay on the part of the road authority, that body is to indemnify the company against all expenses and penalties to which they may become liable by reason of the delay or failure to execute the work.

There was allegation in the discussion on the paper as to the inefficient work of some companies in restoring the soil to trenches after making openings for pipe laying, which, it was said, results in the lapse of considerable periods—sometimes beyond the statutory requirement—before subsidences, and consequently unevenness, of the surfaces of the roads are overcome. Mr. Brown erred somewhat upon a point of time in saying that a company may open, fill-in, and then maintain for a period "of six months." The words of the Gas-Works Clauses Act, 1847, are: "Shall keep the road "or pavement which has been so broken-up in good repair "for three months after replacing and making good the "same, and for such further time, if any, *not being more than* "*twelve months* in the whole as the soil so broken-up shall "continue to subside." The six months should therefore be twelve months. But the period of subsidence, of course, varies—in the discussion on the paper, twelve, sixteen, and even twenty-four months were spoken of as periods within which settlement went on. Road surveyors seem to incline to the idea that the long periods during which subsidence sometimes continues is invariably due to bad reinstatement work. It is not necessarily so. It may be very largely owing to the character of the subsoil; and it ought to be the object of everyone responsible for maintenance after the work is done to see that the re-filling is carried out as thoroughly as possible, as upon this the subsequent cost of maintenance greatly depends. Of course, the ideal condition would be, in the restoration of the soil to the trench, to get in the same amount as occupied a given space before disturbance; but the ideal is impossible of achievement—variation in the quantity returnable to a given space being due not only to the care taken in ramming, but to the character of the soil. Not even the use of mechanical rammers will enable the same amount of soil to be returned to the trench, less the quantity displaced by the space occupied by the pipe or other work that has found accommodation in it. The use of mechanical rammers, and the prescription that in re-filling the layers of soil should not be more than 6 inches in thickness, are among the other suggestions of Mr. Brown. Even mechanical rammers will not ensure that there will not be some settlement, though no doubt the mechanical machine solidifies better, and does reduce the variation of the degree of consolidation that one finds with different men, though working with the same weight of hand rammer. But we should like more information as to initial and working costs, and speed of performance, with the mechanical appliance. Working costs apart, the machine should produce a better consolidation than the man; and this should reduce maintenance costs. If machine rammers of the kind are of mutual benefit, why should not the road authority keep a set which could, by payment, be used by any body occupying the subsoil of the roadways? The local authorities themselves would require something of the kind when they made road openings, and so would the gas, electricity, water, and other owners; and in a limited area, there is no occasion for all these different bodies to provide themselves with such appliances.

In reference to the surface material, Mr. Brown suggests that this should be replaced immediately on a suitable foundation from 4 to 9 inches in depth, with a surface coating at least 3 inches thick; and that the latter should not be confined to the limits of the trench, but should extend beyond, and so be incorporated with the materials of the adjoining surface. The suggestion is all right, providing there is no subsidence; but every time there is a making-up of the trench surface after settlement, is the same overlapping operation to be repeated? Surface reinstatement is provided for generally in the legislation applying to the subject; and, to the best of our knowledge, the only specific clause which deals with it is in the Gowerton Gas Act of 1910. There it is specified that the Company shall provide a foundation of at least 4 inches of rough ballast, and a top coating of 4 inches of metalling; that all subsidences exceeding 2 inches deep along the surface of the trench are to be made good immediately after they occur; and that there is to be rolling so that the surface becomes uniform with the unbroken surface adjoining. We cannot see that there is much in Mr. Brown's suggestion as to the overlapping of the new surface—at any rate, until settlement in the trench has ceased.

However, it is very interesting indeed to hear the road surveyors on the subject of trench work; but, in this instance, the paper, judging from the abstract in our columns last week, stops short at points upon which the occupiers of the subsoil of roads would have liked further information—as to mutual advantage, terms, working expenses, and so forth—in order to see how far they could go with the author, and what conditions it would be necessary to apply to his suggestions so as to prevent one-sidedness.

"Inequalities" in Meter-Rents.

The Directors of the South Suburban Gas Company are, in order to remove "inequalities" in meter-rents, proposing to make the rents uniform, irrespective of the size of meter! Inasmuch as there is "inequality" in the sizes of meters and the expenses attaching thereto, the suggested process of equalizing the rents appears somewhat quixotic, and requires a little explanation, in order to make clear to reasoning individuals outside the Board how it will produce equality as between the users of the different sizes of meter—that is to say, dealing with meter-rent as being an altogether distinct charge from that for gas. If special treatment be required in respect of the custom for gas, this should be dealt with strictly on its own merits. The matter is discussed in an article in later columns.

Membership Campaign of the "B.C.G.A."

If all meetings that are held in connection with the recruiting campaign of the British Commercial Gas Association are as enthusiastic as the one held last Thursday in Birmingham, an opulent success ought to attend the work that is now in hand. We congratulate the Hon. Secretary of the Midlands District Committee (Mr. J. Ferguson Bell) on the character of the meeting, and Sir Hallewell Rogers, Chairman of the Gas Committee of the Birmingham City Council, upon having the opportunity of presiding over such a gathering. The only thing that we are afraid of about these member-recruiting meetings is that the majority attending represent the converted, and the minority the unconverted. But the important thing is that every new recruit means an access of power, and is an influence for good among other non-subscribing concerns. From Sir Hallewell's speech throughout the proceedings at Birmingham, with one exception, there was good and healthy testimony as to the character of the work being done by the Association; and the one exception threw the mass of testimony into stronger relief.

Illustration of an Old Contention.

In Sir Hallewell's remarks, there was a passage which was striking. Speaking of Birmingham, he said: "During the past three months, they had received seventy inquiries through the Association, in response to their advertisements, relating to the industrial uses of gas; and when he told them that, among these inquiries, were the names of some of the largest manufacturing concerns in Birmingham, they would realize that the advertisements inserted in the various daily and weekly newspapers had caught the eye of the right people, and those whom the advertisements had been designed to attract." Of course, all subscribing gas undertakings could not expect to get in three months seventy inquiries directly through the offices of the Association. Some of them might not get any; but this does not mean that inquiries that are received by the local gas office are not influenced by the work of the Association. This work fills up the gaps of, and so completes and consolidates, local effort. The quoted passage from Sir Hallewell's speech confirms what we have long held. No matter how efficient and how thorough the system of local publicity and canvassing effort, there are numerous people—some highly important—who will not see any local canvassers, habitually consign advertising literature to the waste-paper basket, and rarely open local newspapers. But articles and advertisements will attract them in their professional or trade papers, or in their favourite daily or weekly illustrated papers or magazines—in fact, in all the main roads and by-ways of general news and literature which are not, and cannot be, covered by local enterprise. The men in those large manufacturing concerns whose eyes and ears the Birmingham Gas Department had probably often tried to arrest in one way or another were at length captured by something or other that they saw which had emanated from the Association. The organization operates where local undertakings do not; and there is in this consolidation and expansion for the whole industry.

Further Working Results.

Since reference was last made to the matter in this portion of the "Journal," further progress has been made in the setting on record of the working and financial results achieved by municipally owned gas undertakings during the twelve months to the end of March last. A falling off to the extent of 3½ per cent. was experienced in the make of gas at Burnley, where one of the adverse factors to be contended against, so far as consumption is concerned, has been the non-lighting, since the introduction of the military order, of 1850 of the public lamps. There is exhibited a very substantial increase in the make of gas per ton of coal carbonized. Clitheroe, too, has had what is for them quite an unusual experience—as, in fact, it is with most gas undertakings—in a decreased consumption. And the same remark may be made concerning Middleton, where the falling off in the total quantity of gas made was just under 2 per cent. The slackening at Middleton was in the demand for gas for industrial purposes, owing to short time in the cotton mills. Here, as at Burnley, there is recorded a very large increase in the make of gas per ton of coal. A loss on the year's working at Oldham is attributed mainly to the great decrease in the amount received for residual products. The quantity of gas made was about 2¼ per cent. less than in the preceding year; but, on the other hand, there is a gain in the fact that the average quantity of coal gas made per ton carbonized shows a good increase when compared with that of twelve months ago. The decreased consumption, in this case also, was in respect of mills and workshops; there having been an increase in the quantity of gas consumed in houses and shops. Smethwick comes on the other side, with an increase in the total quantity of gas sold and accounted for of 2½ per cent., though, coming to details, sales for power and manufacturing purposes, and the use of gas for public lighting, both exhibit some decrease. At Stourbridge, too, there are increases under all heads except public lighting; and both the gross profit and net surplus are larger than a year ago.

A Subject-Matter Index.

In the course of a letter (in part, of a private nature) Mr. George G. Ramsdell, the Secretary-Treasurer of the American Gas Institute, makes reference to the Panama-Pacific Exposition, and to the well-known fact that the Institute are going to hold their annual meeting in the Fall in connection with the Gas Congress in San Francisco. This means that the Institute meeting will be a very small affair in comparison with past annual meetings. This would, of course, reflect itself in a considerable diminution of the size of the annual volume of "Transactions," were not steps taken to swell it in a manner which (though the contents will not be of normal character) will be valuable to the members. Mr. Ramsdell tells us that the steps that are going to be taken by the Council to this end are to avail themselves of the opportunity of having prepared a complete subject-matter index of the volumes covering the ten years from and including 1906. There is no question about it that, in the early volumes of the American Institute, the index is very imperfect; and it has been exceedingly difficult to turn to the volumes and find any particular subject, with the exception of the most prominent papers and reports. But there is a great quantity of matter not so imposing—sometimes in short papers, and sometimes incidentally embedded in longer communications—which is equally important, but which is often inaccessible until much exploration has been made, simply owing to the absence of a full and proper index. The complete index is to be distributed in connection with the "Transactions;" and Mr. Ramsdell thinks the members will much appreciate it. We are quite confident this will be so, especially by those who have to frequently make search for information.

A Suggestion for the Institution of Gas Engineers.

In this decision of our American friends, there is a good suggestion for the Council of the Institution of Gas Engineers. The proceedings of the Institution this year have similarly, but through different and less congenial causes, been particularly thin; and consequently the volume of "Transactions" for 1915 will be very lean, unless something useful is introduced to extend the distance of the back cover from the front one. This being so, we cannot conceive there will ever be a more propitious time for giving the members a thoroughly good subject-matter index of all the technical and commercial topics that have engaged, at annual meetings, or through the work of Committees, the attention of the Institution (under whatever appellation it has existed) during the past fifty odd years of life. Such an index, if prepared with intelligence and discrimination, would be of immense value to the gas profession. At the present time, it is not by any means an easy matter to wade through the whole of the records of the Institution to find out what has transpired in past years on any particular subject. Admittedly, there would be a large amount of labour tached to the preparation of an index of the kind, covering ore than fifty years; but this accomplished, it would be an easy atter hereafter to publish such an index for every ten years. ther societies provide members with complete subject-matter in-ices; examples readily coming to mind being the Society of Chem-al Industry, the Institution of Water Engineers, and the Society f Engineers. Why not the Institution of Gas Engineers?

efective and Valuable Indexing.

But such an index (the emphasis is needed) must be well and ystematically done. It is no use having it unless it is. It must e something of a more complete character than is now given of he subject-matter of the year in the annual volume. Take two r three instances from last year's "Transactions." Mr. Purves ead a paper on "The Application of Coke-Oven Carbonizing nd the 'Otto' Direct Ammonia Recovery System to Gas-Vorks." A man wants to find what was said as to the "Otto" ystem. He forgets the name of the author of the paper, the year, nd does not remember that it was linked-up with a coke-oven aper. He searches through the index. Looks under "Ammonia," Otto," and "Sulphate." It is not indexed under any one of hese headings. The only reference to the whole contents of he paper is under "Coke-Ovens." Mr. John West read a paper ealing more with the use of sulphate of ammonia than lime in griculture. In the subject-matter index, the paper is named under Lime," and not under "Sulphate." "Phenomena of Surface ombustion" appears in the same subject-matter index under Phenomena," and not under "Surface Combustion." "Influ-nce of Red-Hot Coke and Radiant Heat on the Gaseous Pro-ucts of Carbonization" appears under "Influence!" Instances ight be multiplied of defect in subject-matter indexing, which ill only intensify labour in finding subjects a few years hence. Vith, we repeat, intelligence and discrimination in indexing—not therwise—a complete subject-matter index would be valuable. Ve leave the idea for the consideration of the Council, with the emark (in case want of time should be put forward as an excuse) hat there are nearly six months left of this year; and if the rinting of the volume of "Transactions" is completed up to a oint, the sheets could then wait for a time for the suggested ndex. The contents of the volume, as it stands, will not be of uch burning importance that the members of the Institution will e injured by lingering a while for something which would be of eal value to them.

oal Exports.

In last week's "JOURNAL," in the article on "Northern Coal eliveries and Exports last Winter," reference was made to the act that, as the war progressed prior to the appointment of the oal Exports Regulation Committee, there had been a marked hrinkage in the monthly decreases of the exports of coal in com-arison with the corresponding pre-war months. This shrinkage vas due to the large increase in the exports to neutral European ountries, a not inconsiderable part of which increase it is, on good rounds, suspected found its way into Germany, while the home-and was urgently requiring more coal. This was during last vinter; and the maximum shrinkage in the decrease of tonnage ver the corresponding pre-war months was not reached until pril—the month preceding the appointment of the Coal Exports egulation Committee. The following figures tell their own ale: During the five war months of last year, the decrease upon he corresponding period of 1913 averaged 2.721,750 tons per onth. Then in January, the decrease shrank to 2,319,373 tons; n February, to 2,189,714 tons; in March, to 2,026,964 tons; and n April, to 1,459,882 tons. The Exports Regulation Committee ame on the scene; and in May, the decrease was raised to ,501,806 tons, and in June it was 2,274,000 tons. These last two eturns are a great improvement on what was shown in April. Vith the June decrease, the total reduction of exports since the eginning of the war is 26,380,529 tons. If the process of getting o a nearer level with the monthly exports of 1913-14 had con-inued, there would have been more gradual progress in the build-ng-up of this total figure; and with what enormous advantage to he enemy?

il Business and a Dividend.

The oil-trading companies have had a very comfortable finan-ial experience for a considerable period, owing to the increased demands for oil for all sorts of purposes—particularly for motive power on land and sea. The requirements of the gas industry have also been greater owing to the coal situation; but now that the export of coal to neutral countries has largely ceased, there should be a keener competition between the coal and oil proprietors for the business of the industry. The coal industry is well aware of this; and we believe it to be a fact that, where oil-gas plants exist, there better terms have been quoted for coal than where there are no oil-gas plants. When coal is dear, if oil is at a reasonable price, carburetted water-gas plants are kept running "full bore." When reverse conditions exist, the latter plants are partially let down. The demand for, and price of, coke is, of course, a factor in the situation. However, the well-established oil trading companies, whose supplies are not much affected by the war, have (as already said) had a healthy time of it. At the recent meeting of the Shell Transport and Trading Company, the Chairman (Sir Samuel Marcus, Bart.) stated that the Company would have scorned to avail themselves of the necessities of the nation to attempt to make war profits; they had sedulously abstained, even in cases where it would have been possible and legitimate to do it, from exacting more than normal prices for their products. The dividend paid for the year was 35 per cent., free of income-tax. Investments in sundry companies were increased during 1914 by £1,224,280; and the sum of £436,795 was carried forward, against £326,564 brought in. Whether or not the Company have made war profits, the oil business has not been an unprofitable one for them over the past twelve months.

Engineering Work in Japan.

At the present moment, opportunities, and even possibilities, of engineering shops in this country undertaking new work of an unwarlike character are far smaller than has been the case in other circumstances. Nevertheless, attention may well be drawn to some remarks by H.M. Commercial Attaché at Yokohama, on the subject of the machinery trade of Japan. Considerable importations of machinery into Japan take place every year; and it is pleasing to note that the United Kingdom remains well at the head of the list—now enjoying more than 50 per cent. of the business. Since the war broke out, very few orders have been placed; but as confidence is returning, it is thought within the next few months it will be possible to secure a certain quantity. It has, however, to be remembered that Government Departments, believing in the wisdom of supporting home industries, place their orders in Japan, whenever it can be done; and, as bearing upon this point, it may be mentioned that Japanese engineering works are increasing in number and in capacity, being assisted by the heavy import duties. In view, therefore, of the fact that the manufacture of machinery in Japan is making considerable progress, and that unless some thought is given to the problem manufacturers in this country may lose a part of the business which they now enjoy, the suggestion is put forward that makers of small machinery of a class which is sold in quantities in standard sizes—such as gas-engines, electric motors, pneumatic drills, pumps, &c.—should send their goods for sale consigned to firms of high standing, so that stocks can be kept. It is stated that the importing firms themselves are rarely willing to tie-up their capital in stocks, as the profit they can obtain is often eaten up by local high interest charges; while the manufacturer, who has naturally added a considerable amount to his price for standing charges and profit, would only be paying interest on the first net cost, and would also probably be able to borrow money at a cheaper rate in the United Kingdom.

Society of British Gas Industries.—The members of the Society visited Exeter last Thursday week, meeting in the Rougemont Hotel, where Mr. F. Templer Depree, J.P. (Chairman), entertained them at dinner. It was a very pleasant gathering. Next day, some of the members played on the Exeter Golf Links for the silver challenge bowl of the Society.

Coke Breeze for Locomotives.—On the Baltimore and Ohio Railway experiments have, during the past year and more, been carried out with the use of coke breeze as locomotive fuel; and at certain works arrangements have been made for the obtaining of a better grade of coke breeze, which is sold to the Railway Company. This fuel, however, proves satisfactory for locomotives only when consumed in engines fitted with stoking devices; and forced draught is necessary to secure good results. Then it is said to compare favourably with the low-grade coals that are sometimes used as locomotive fuel.

PERSONAL.

Additions to the Commission of Peace for Surrey lately made include the name of Mr. Dugald Clerk, D.Sc., the expert on gas-engines.

The marriage took place last Thursday, at Dovercourt Parish Church, of Mr. Wilfrid E. Jolliffe, younger son of Mr. John T. Jolliffe, of Ipswich, and Miss Hilda Baines, younger daughter of Mr. G. Baines, of Dovercourt. Mr. Wilfrid Jolliffe is the Engineer to the Harwich Gas Company; while Mr. Baines is the Secretary and General Manager.

In the notice convening the annual general meeting of the European Gas Company, Limited, the Directors record, with regret, the death of their former Chairman, Mr. R. Hesketh Jones; and they intimate that they have filled the vacancy by nominating Mr. Charles Carpenter, D.Sc., as a Director, subject to confirmation at the meeting.

Mr. Harold E. Stone, who has just been appointed Superintendent at the Birkenhead Corporation Gas-Works, is at present assistant to Dr. W. B. Davidson at the Nechells works of the Birmingham Corporation Gas Department. He is also Hon. Treasurer of the Midland Junior Gas Association, and lecturer in "Gas Engineering" at the Smethwick Technical School.

Mr. R. A. Browning, of Neath, has been added to the Visiting Committee of gas engineers, acting under Mr. J. H. Canning, of Newport, for the purpose of increasing the supply of high explosives. It will be remembered that Mr. Browning, after 34 years' service, recently retired from the management of the Neath Gas-Works, but continues to practise as a consulting gas engineer.

To fill the vacancy of Borough Engineer at Darwen, caused by the death of Mr. R. W. Smith-Saville, Mr. Eli Marsden, the Chief Assistant in the department, has been appointed. Mr. Marsden became articled twelve years ago to the late Mr. Smith-Saville, and has been in the service of the Corporation ever since. He has been entrusted with several important schemes, notably the Bolton-Darwen water supply.

The death last April of the Chairman of the East Surrey Water Company, Mr. Peter Riddoch, is referred to with regret by the Directors in their annual report. Deceased had been connected with the undertaking for nearly a quarter-of-a-century. Advancing years having precluded the Deputy-Chairman (Sir Myles Fenton, J.P.) from taking the position, the Board first elected Mr. H. F. Acland Hood as a Director, and then made him Chairman.

Mr. Hubert B. Knowles, son of Mr. R. Knowles, a member of the Morecambe Town Council, has been appointed Assistant Gas Engineer to the Darwen Corporation, where he has been articled to the Manager, Mr. A. H. Smith. Mr. Knowles passed first class in "Gas Engineering" and first class in "Gas Distribution," in the recent City and Guilds of London examinations. He was one of six only, out of 130 candidates, who passed first class in both subjects.

The wedding took place, at the Church of the Sacred Heart, Exeter, last Tuesday, of Alderman F. Templer Depree, J.P., and Miss Mary F. Bowerman Moore, of Exeter. A reception followed the ceremony; and later Mr. and Mrs. Depree left on a motor tour. The large number of wedding presents included a handsome silver salver and rose-bowl from the Directors of Messrs. Willey and Co., of which Company Alderman Depree is Chairman, and a silver cigar-box from the members of the Council of the Society of British Gas Industries, of which he is President for the year.

Last week the advertisement columns of the "Journal" contained an announcement by the Directors of the Salisbury Gaslight and Coke Company that they were prepared to consider applications for the position of Manager of their works. The "Salisbury Times" of Friday's date says: "We understand that Mr. N. H. Humphrys, the Manager of the Salisbury Gaslight and Coke Company, has tendered his resignation to the Directors on account of his health not being equal to the increased strain cast upon him by worries and anxieties brought about by the war. The resignation takes effect at Michaelmas. Mr. Humphrys came to Salisbury in 1883, and has therefore put in 32 years in his present position, in which time the undertaking has been immensely developed. In his profession Mr. Humphrys deservedly enjoys the highest reputation as a chemist."

The last Australian mail brings the announcement of the retirement of Mr. S. E. Figgis from his position as Engineer and General Manager of the Ballarat (Victoria) Gas Company. During 47 years' service with the Company, he has seized every opportunity to instal the most modern plant in the works; and many readers will remember that about two years ago he visited England and the Continent to inspect the latest improvements in carbonizing methods and gas apparatus generally. While on this visit he ordered what is stated to be the first plant for Australia for the manufacture of sulphate of ammonia by the "direct" system. After inspecting many installations, he reported to his Directors on the vertical system of carbonization, plans and estimates for two methods of which he took back to Australia with him. Then about a year ago he recommended the adoption of a free installation system, which has proved very successful in extending the consumption of gas. During his long connection with the Company, Mr. Figgis's relations with the Directors, officers, and men have always been of the most amicable nature.

With much regret, the Directors of the Gas Light and Coke Company have accepted the resignation, owing to ill-health, by Mr. T. Wilton of the position of Superintendent of the Products' Works. The Board have passed a resolution expressing their appreciation of his long and valuable services to the Company, and their hearty wishes that, in the calm of retirement, his health might be re-established. Referring to the matter, the Company's "Co-Partners' Magazine" remarks that there is no doubt Mr. Wilton's health was much impaired by the whole-hearted energy he devoted to his military duties. As Lieutenant-Colonel of the "Rangers" he was mobilized at the outbreak of war; and from that moment until prohibited by the doctors he gave himself unceasingly to the service of the distinguished Territorial regiment which it was his privilege and pride to command. Mr. W. G. Adam, whom the Directors have appointed to succeed Mr. Wilton, entered the Company's service in 1910 as a Research Chemist at the Products Works. During the protracted absence, owing to military duties and subsequent ill-health, of Mr. Wilton, Mr. Adam assumed the sole control of the works, and has been responsible for fulfilling the instructions of the Directors in connection with the work, some of it of a very special character, now being carried on there.

Gas-Works Tar as a Street-Binder.

Mr. A. F. Kersting, of the Mobile (Ala.) Gas Company, deals, in the "Gas Record," with an experience of the use of gas-works tar for street surfaces. Describing the method of heating and applying the tar, he says there was installed for the plant a heater consisting of 22 feet of 12-inch pipe flanged at both ends, in which are connected two coils of $1\frac{1}{2}$-inch pipe, approximately 400 feet in all. Steam at boiler pressure is admitted to these coils, and the outlet-valves cracked to drain the condensed steam. There is an open top tank on the roof of the boiler-house, 5 feet in diameter by 7 feet deep, into which the tar is first pumped from the well. Tar is drawn from the bottom of this tank through the heater-pipe, flowing therefrom by force of the tank head into the waggon. The sprinkler waggon has a spray-pipe connected in the back end near the bottom, with branches running to either side, which covers about 7 feet width. The perforations in the pipe are about $\frac{1}{8}$ inch diameter, and 1 inch apart. The regular attendants of this waggon are quite expert in opening the valve; so that with ordinary walking speed of the team, the tar is distributed in the correct amount in one passage. The streets generally are made with a 15-feet surface, which means $1\frac{2}{3}$ gallons of tar per running foot. Taking this at 5c. a gallon, the cost is about $400 per mile of street improved.

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Gas at the Panama-Pacific Exposition.

In a circular giving detailed information regarding the forthcoming International Gas Congress in San Francisco, Mr. G. G. Ramsdell, the Secretary of the American Gas Institute, remarks as follows regarding gas at the Panama-Pacific Exposition: "The two leading features of the exposition are its architecture and its illumination. The latter is unique in its departure from all former methods. Flood lighting takes the place of the old-fashioned outlining of buildings; and the colour scheme of the exposition lends itself admirably to this form of lighting. Some hundreds of powerful searchlights and thousands of electric bulbs, together with the gas lighting, spread a glow of light over the entire exposition, amounting to over four billion candle power. This is probably the first exposition where gas has come into its own. There are miles of high-pressure gas-lamps on ornamental posts. The "Joy Zone" is illuminated by gas arcs, concealed in ornamental lanterns; and in the Court of Abundance there are gas fountains with serpents hissing streams of high-pressure gas. At night time the effect is magical. No such lighting has ever been attempted before. Shaded lamps are reflected on the sides of the buildings, searchlights shine constantly on statues and columns; and the great Tower of Jewels, grey by day, is pure white in the rays of these searchlights. The columns of the Tower at night are of the most exquisite turquoise green; and its jewels flash and gleam in the soft California breeze. Nowhere but in such a climate, and under such a sky, would this exposition be possible. Gas is also used from end to end of the exposition for cooking and heating; and the service is everything that could be desired. In the Palace of Manufactures we have a collective gas exhibit covering a floor space of 10,000 square feet; and enclosed in a beautiful pavilion is a comprehensive exhibit of every phase of manufacture, distribution, and use of gas. The exhibit is so well lighted that it became necessary to have large glass signs hung at different points stating that this exhibit is 'Lighted by Gas.' It was found that our electric friends were taking credit for the bes example of interior illumination in the exposition."

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Mr. James Longley, who died at Crawley on the 23rd ult., aged 79, had been Chairman of the Crawley District Water Company since its formation.

In the list given last week of successful candidates in the recent "Gas Engineering" examination of the City and Guilds of London Institute, Grade I., second class, the name of Mr. Joseph Jubb wrongly appeared as Tubb.

A SOUTH SUBURBAN TACTICAL BLUNDER.

Unifying Meter-Rents for all Sizes.

> At the present time, the charges for the hire of meters vary in the different districts comprising the Company's area of supply, and *to remove inequalities*, and bring the charges more nearly in accord with existing conditions, the Board have decided to make a uniform charge of 1s. 6d. per meter per quarter, *regardless of size or locality*. The new charges will operate from and after the end of the Midsummer quarter; and, to put the matter in order, I shall feel obliged if you will kindly sign the appended slip, and hand it to our collector when paying the accompanying account, or enclose it with your remittance.

The agreement reads as follows:

> With reference to my [our] agreement with your Company for the hire of a gas-meter, I am [we are] willing that, as from the Midsummer quarter, 1915, the rent charge shall be one shilling and sixpence per quarter, or any part of a quarter, and I [we] agree to pay such rent charge, in lieu of that mentioned in the agreement, which, as varied, I [we] hereby confirm.

THIS is a circular and a form of agreement issued to the consumers of gas in the area of the South Suburban Gas Company; and, after reading both with care, we should imagine that the "I's" and the "we's" will not be "willing," and, in fact, should refuse, to sign the new agreement in cases where their meter-rents are less than 1s. 6d. per quarter, unless the Board, who are anxious to remove "inequalities," supply them with something more than the indefinite information given in the circular, and so satisfy them, as to the grounds upon which they suggest that fairness demands that 1s. 6d. per quarter should be paid per meter regardless of size or locality. We have little doubt that a large majority of the consumers pay less meter-rent than the amount named—at any rate, in the old South Suburban district, which, in the matter of magnitude of business takes precedence of the annexed Bromley and West Kent areas.

There are certain questions that readily occur to one on reading the circular. They are:

(1) Why have the Board been so long in discovering that a uniform meter-rent of 1s. 6d. per quarter was necessary in order to remove inequalities?

(2) What is the nature of the inequalities?

(3) Will not "inequalities" of another order exist by charging a uniform rent for meters of different sizes, which originally cost disuniform amounts, and now do so for (where the original cost has not already been wiped out) interest and for upkeep?

(4) Is not 6s. a year an extravagant charge for meters of the smaller sizes?

(5) And is it a politic thing to propose a charge of this kind just at the time when the price of gas is at an exceptionally high figure owing to the conditions imposed by the war?

The curious proposition (which contemplates the disturbance of an ancient order of things in the South Suburban area) has raised a hornet's nest about the Directors' ears, which is not surprising. It is difficult to understand, without further explanation, how the Directors came to think that people with agreements for a certain lower rent than that now proposed would be, *ex abrupto*, induced to sign an agreement to pay more on such a bald statement as is put forward in the circular. Casting one's eyes round the Board-room table, we cannot see a single individual there who, were he faced with the same suggestion, had no interest in the Company, and was paying a smaller rental than that proposed, would be, on such representation as this, prepared to make a change, without more evidence that right really demanded it. The Company are, of course, quite at liberty, in the case of all their ordinary meters, to make what agreements they think proper with consumers, so far as payment of meter-rent is concerned. But they fixed and agreed the scale of meter-rents years ago; and the agreements that have been made over a long course of years for rents at a lower figure than are suggested to-day ought not be alterable by the Directors, in this very summary fashion, without the consumer consents. Surely in altering a legal instrument such as a formal "agreement," some longer notice should be given than was done in this instance, in which the announcement of the proposed change to have effect at Midsummer was only made at the same time as the Midsummer accounts were sent out. The Board, in other words, seek to alter one condition of subsisting agreements, and put the new condition into force, before the fresh agreement is accepted and signed by the consumer. This is not an equitable proceeding. Against a consumer under a present agreement who is not "willing" to pay an increased meter-rental, the Directors (until the old agreement is formally cancelled) could have no possible immediate remedy. If they had, and put it into force, it would only mean making a permanent enemy. There must be two or more parties to any "agreement;" and "agreements" of this kind are not mere "scraps of paper." In this case the brusque manner in which one of the parties proposes to amend the agreement does not appeal to us as being defensible from the point of view of justice.

There are numerous houses in the Company's district that have the same meters in them that were there years ago, and for which 9d. per quarter has been, and is, the charge. The Board, until now, have been quite satisfied with these charges. Has anything altered the capital and depreciation charges for those long resident meters? It would not be well perhaps to publicly go into the financial history of numbers of meters, and to draw up a balance-sheet showing total expenditure—embracing capital, depreciation, and maintenance charges—on the one side, and total receipts on the other. Certainly, however, consumers are entitled to be shown a better case than the circular discloses as to how "existing changes" in conditions—changes referring to increased prices of meters to-day, and upkeep charges—affect the meters over which, prior to the war, and when the price of the gas was lower, there was perfect contentment on the part of the Board, who (or their predecessors) fixed what was a fair rate of rental when the meters were installed. If a change is desirable at all, it should be in relation to new agreements for meters purchased under current conditions. It seems to us that the correct, and therefore just, method of removing any inequalities obtaining between district and district is by levelling-down the higher charges in the higher rented districts for meters *of the same size* as those existing in the district where the lower rentals prevail, and which were long considered satisfactory, and not by penalizing consumers in the old South Suburban area.

We have not the slightest doubt that the Directors will try to make out a plausible defence of their action in this matter; but they should have taken the precaution of disarming criticism when proposing the change. What is one result of their reticence in making the consumers properly acquainted with the nature of the "inequalities" due to existing conditions? The "Star" (which no doubt reaches the homes of many consumers in the Company's district with meters rented below 1s. 6d. per quarter) has taken up the matter, and is promoting agitation against the proposal. A point made by our evening contemporary is that the levelling-up of the rental of the small meters to 1s. 6d. per quarter will produce a larger revenue from householders, if they consent to alter their agreements, and continue to be patrons of the Company. If it does, then there is little that can be said in the way of criticism of the contention of the "Star" that the Board are doing something which has a bearing on the operation of the sliding-scale. The "Star" says:

> The small consumers now pay 9d. per quarter meter-rent; and if they sign this artful form, they will have to pay 1s. 6d. The Company, therefore, will draw 9d. extra from each, and in the case of consumers who use about 5000 feet of gas per quarter this works out at about an additional 1¾d. per 1000 feet *without any reduction in the dividend*.

Then it seems to us that, by charging a uniform rent for all sizes of meters, the Company are proposing to iron-out inequality between district and district by imposing another inequality. It would be interesting, for instance, to study an attempted defence of the charging of a householder 1s. 6d. per quarter for a 5-light meter, and only the same amount to a consumer having a 50-light meter. The man with the 50-light meter should be (if he is not) the more profitable consumer of the two. A uniform meter-rent (*quâ* meter-rent) for all sizes of meter is wrong in principle. Where meter-rents are charged, they should stand alone without any reference to external circumstances; and monetary consideration to large consumers should be based upon the quantity of gas consumed, seeing that two consumers, both having large sized meters, may be totally dissimilar in the amount of their custom, and therefore as profit producers for the Company. The larger meters cost more, and the expense of their upkeep is more; and, by charging uniform rents for meters irrespective of size, householders with the small meters are helping to defray the charges which should, through meter-rent, be defrayed by the consumers with large meters. For the smaller sized meters, 6s. a year is not (unless the meter is simply used as a stand-by) a politic charge, when something less has stood as satisfactory for years.

Considering the wisdom of the proposal in relation to time, it seems to us that the greatest blunder the Board of the Company have made, if inequality exists which ought to be righted (by means other than uniformity of rental for all sizes of meters), is in making their proposal in such abnormal times as these, when the price of gas is high, instead of in normal times, and (prudently) when they were proposing to give the consumers a reduction in the price of gas. The one proposal would have taken away the sting of the other, which means a permanent increased charge. Whatever the Directors may say in defence of their rent-unifying proposition, they have certainly chosen a very inappropriate time for suggesting the change.

[Since the foregoing was written, we hear from consumers in the old South Suburban district that the resolve is widespread not to sign the proposed agreement.]

Coal-Tar Dye Manufacture in Switzerland.—It is suggested by the "Chemical Trade Journal" that the present is proving far from a happy time for Swiss dye manufacturers; the chief raw materials required in the making of dyes being those employed also to produce modern explosives. Swiss manufacturers are dependent upon foreign countries for the supply of these raw materials; and as Germany has rigidly prohibited their exportation, the only source of supply of any importance is England. There is, it is remarked, no necessity to point out that the situation in the Swiss dye industry will augment considerably the troubles of British consumers in obtaining supplies of coal-tar dyes. "Once again, it may be stated, where important branches of British industry are more or less completely dependent upon supplies of certain commodities, all practical means should be taken to encourage the production of those commodities within the confines of the United Kingdom."

ELECTRICITY SUPPLY MEMORANDA.

Our Queens and a Cookery Book.

A MOMENTOUS announcement has appeared in the "Electrical Times." Mrs. Maud Lancaster has written to Her Majesty the Queen and to Her Majesty Queen Alexandra, asking their acceptance of a copy of her book "Electric Cooking, Heating, &c.;" and, by command of the Queens, courteous little acknowledgments have been made. Our contemporary is overjoyed at this signal mark of Royal favour. It thinks that the courteous acknowledgments are indications that Queen Mary and Queen Alexandra "are interested in electricity in the service of the home;" and that "it is not perhaps unreasonable to hope that study of Mrs. Lancaster's book, which is written from the point of view of the housewife, may result eventually in the complete electrification of the Royal kitchens." There is nothing whatever in the little acknowledgments to suggest any particular interest; and, as to the "study" of the work by the two Queens, we have personal recollections of the many yawns that accompanied, in the interests of justice, our complete study of the book, and of the sorrow experienced by us at finding so many points in it for adverse criticism, though the work was edited by the husband of the authoress, and he an Assoc.M.Inst.C.E., and a M.Inst.E.E. We hope that expurgated copies of the work were sent to their Majesties because, if not, they might be grievously misled on several points, which would be unfair. Indeed, we are not altogether sure as to the propriety of sending "feeble efforts" to their Majesties which are addressed by Mrs. Lancaster to her "sisters in distress." Perhaps loyalty to their Majesties and to the gas industry should impel us to send copies of our review of the book [see Dec. 29 last, p. 729] to Buckingham Palace and Marlborough House. We will think over the matter.

Iron Crosses.

Before the war, British electrical undertakings were customers on quite a grand scale of the German manufacturers. The sharp cleavage of the amicable electrical relations which helped to enrich Germany, and to fill the war-fund chest of that country, brought to an end the patronage; and it is to be hoped that, at the close of the war, the home electrical industry will not revive it. If it does, it may be assisting in the provision of funds and stores for the slaying of our posterity, and for the exercise upon our successors of further frightfulness. It will also be assisting to succour men who have been engaged in killing our men and those of our Allies by all the processes which a rascally ingenuity could devise. We see that, during last year, the "A.E.G." of Berlin have been largely engaged on Army orders for the German Government, that the Company hold German War Loan securities to the value of £600,000, that 18,000 of their employees are in the field, that 450 of them will not return to the service of the Company, but that, if spared, 500 of them will do so decorated with Iron Crosses. It is hoped that the joy of these men and of their employers will not be intensified, and the conduct of Germany be condoned, by a resumption later on of the conferment on them of British electrical contracts. If any of the Company's capital is invested in this country, the home electrical industry should see that the return upon it is in future *nil*. *Gott Strafe Deutschland*. We may as well return the plea, with the heartiest wishes for its fulfilment.

Coal and Coke Breeze.

The question of coal supply is not worrying central electricity station engineers so much as it was last winter. Some of them had a lesson then which they will not speedily forget as to the necessity of making larger provision of stocks of fuel. The 1912 strike ought to have had that effect; but it did not universally. What is now worrying electrical engineers is the cost of coal under new contracts, because the allowance for generating expenses is cut so fine that heavy increases in fuel prices are not provided for, nor are they in certain of the tariffs of the stations. Mr. S. E. Fedden, of Sheffield, states that he will have to pay 10s. per ton more for coal (making 18s. per ton) under his next contracts; and three or four of the principal items in electricity costs will, in the case of Sheffield, mean a total of £23,000 extra next year. Then Mr. Thomas Roles, of Bradford, estimates that 60 per cent. more will have to be paid in his case under coming contracts. There are good business men in the electricity industry who work things to the advantage of their concerns. Mr. S. T. Allen, of Wolverhampton, has arranged a contract for coke breeze "at a low figure," which, he says, will "help things." We hope that his "low figure" means something corresponding with fuel value. Then Mr. J. Horace Bowden, of Poplar, says that one of his troubles in getting coal has been the shortage of trucks. This being so, he has hired forty for his undertaking, and keeps them running continuously. This is not a bad idea.

Hot-Plates and Servants.

On the 17th ult. the Point-Fives dined together at the Tricity Restaurant. It seems to have been a solemn function. It happened to be the evening of the day when two of their number had presented to the Incorporated Municipal Electrical Association a report on the 0·5d. tariff, and had had a very bad dressing-down for their pains from the electrical critics of the system. [See "Memoranda" for June 29.] Some of the little party appeared to feel very keenly the attitude taken up, as no doubt much harm has been done by the discussion to the cause espoused by the members; so much so, in fact, was the matter taken to heart that the Point-Fives could not rouse sufficient enthusiasm for talking of even the grilling of chops or the baking of jam tarts by electrical means. What, however, they did was to discuss the perennial story of the deficiencies of electric-cooking apparatus, from which again came attestation as to manufacturers not producing the right apparatus for use in the kitchen. Apparatus must be constructed to suit the servant as much as to suit the viands undergoing slow torture, and affecting the tempers of those engaged in impatiently watching for the results. There was bemoaning the fact that servants wasted current in cooking; and electrical cooking, in trying to cultivate a good reputation for something or other, cannot stand waste—electrical waste being too expensive. The Prime Minister tells us that the War Loan might be largely provided by economizing; and, had he liked, he could have added that this cannot be done where there is electrical operation in the kitchen. Mr. Hoadley, the Electrical Engineer of Maidstone, told his fellows in the select band that in his own house, the servant used 50 units in a week to do work which his wife could accomplish with 30 units. Congratulations to Mrs. Hoadley. There was confession on the part of Mr. Hame, of York, that it was an advantage to get a cooker into a house where it was under the eye of the owner, but not much good in a large house. This, again, points to the servant difficulty. Mr. Fedden, of Sheffield, also urged upon manufacturers the necessity of constructing apparatus with an eye to use by servants; and Mr. Shaw, of Ilford, agreed. Hot-plates which show they are hot by being red, were also freely advocated. Mr. Fedden wants one that will get to the red-hot state quickly; and Mr. Cooke, of Luton, desires one which will cool quickly. A plate that will do this will assuredly part with its heat rapidly during use, and so be wasteful by running away with an undue number of thermal units. It is held, however, that less current is employed with a red hot-plate, than with a black hot-plate. Flexibles once more came in for criticism, inspection of apparatus was advocated, and alternating current was charged with being more destructive of cooking apparatus than direct current.

"Half-Watt" Lamp Prices.

Because of the insistence of the makers in calling the new electric lamps by a name to which they have no title, we are compelled to use the same term for descriptive purposes. In last week's "Memoranda," it was shown that so-called "half-watt" lamps are now being made in smaller units, but not lower than a 200-candle power size for voltages of 200-255. But 120-candle power units can be obtained for 100-130 volts; 60-candle power ones for 50-65 volts; and 30-candle ones for 25 volts. These candle-power figures are approximate. It will be remembered that the lamp makers, knowing how variable are their wares in efficiency are dropping describing them by their candle power; and in the case of "half-watt" lamps, they simply say that the consumption is "*approximately* half watt per candle power;" and that "candle power is approximately double the wattage." It will be seen from this that the lamp manufacturers are trying to be more honest in these days, although the description is inconvenient from the consumer's point of view. However, we will not tease them more on this subject on the present occasion, as only recently we had an opportunity of discussing it. It may, however, be interesting and useful to our readers to have the present prices of "half-watt" lamps in their possession.

Voltage, 25.		*Voltage*, 100-130.	
Watts per Hour.	Price of Lamp.	Watts per Hour.	Price of Lamp.
15 ..	4s. 6d.	60 ..	6s. 6d
30 ..	5 6	100 ..	12 6
60 ..	6 6	150 ..	16 6
100 ..	12 6	200 ..	20 0
		300 ..	25 0
		500 ..	30 0
		1000 ..	40 0
		1500 ..	50 0
Voltage, 50-65.		*Voltage*, 200-255.	
30 ..	5s. 6d.	100 ..	12s. 6d.
60 ..	6 6	150 ..	16 6
100 ..	12 6	200 ..	20 0
150 ..	16 6	300 ..	30 0
200 ..	20 0	500 ..	30 0
300 ..	25 0	1000 ..	40 0
500 ..	30 0	1500 ..	50 0

No extra charge, it is stated, is made for pip or half-obscuring the 15-watt to 200-watt lamps; but clear ones are sent, unless otherwise ordered. The makers, as pointed out last week, call attention to the necessity for, in outside work, fixing the lamps in suitable lanterns, efficiently ventilated and weather-proof; and the indirect or semi-indirect system must be used when these lamps are employed for indoor lighting. The efficiency of "approximately" 1 candle per $\frac{1}{2}$ watt is considerably damaged by the necessity for protecting from injury first the eyesight of people, and secondly the lamps themselves.

Electric Fittings Powers. In our "Notes from Westminster" on May 11, reference was made to the fact that, in connection with their Consolidation Bill, the Plymouth Corporation had had their gas-fitting powers in Devonport confirmed by Lord Newton's Committee—these powers being in excess of those allowed by the modern model clause. The reason for this was that confirmation only meant a continuation of the authorization possessed by the defunct Devonport Corporation. In Devonport, too, similar liberty in respect of electrical fittings had also been in the hands of the defunct Corporation; and the Plymouth Corporation thought that this warranted them, on annexing the district, in asking (it was an artful move) that these powers should be confirmed, and applied to the whole of the borough of Plymouth, instead of the model clause, which compels work being done through contractors, and enjoins that the business shall be conducted on a self-supporting basis. Lord Newton's Committee also granted the request. Joy reigned in the electricity supply industry. To both applications the local contractors had entered strong opposition; and the decisions of the House of Lords did not debar them from continuing on the offensive. This resulted in negotiations, and a settlement was effected. The model electric fittings clause has been adopted; but the Corporation retain the gas-fittings powers in the Devonport area. It is a simple compromise; but the "Electrician" thinks the moral of it is that the sooner the position is defined once and for all by the Incorporated Municipal Electrical Association Bill, the better. It is admitted that legislation of this kind is out of the question at the moment. Of course, it has been "out of the question" for some years past; one reason being that Parliament considers it has settled the matter quite satisfactorily in the Model Clauses.

Electric Trading at Hastings. We have on occasion had a little chip-in at the management of the Electricity Department at Hastings; and there are still matters upon which criticism can be hung. At the same time, to be fair, it must be said that the financial position of the department, as shown by the accounts to March 31 last, has distinctly improved. The results, in fact, having regard to the outbreak of war last August, are better than could have been expected; there being a net profit-balance of £846. The load factor, due to the large public lighting load, is an extremely favourable figure with attendant advantages; and it is likely also that there have been improvements in the steam plant, and less expensive fuel—such as coke—is now used. The conversion of street-lamps to electricity continues; and it would probably be difficult to find a more flagrant disregard of the call for economy than this useless expenditure of money, even though it may be at a reduced rate as compared with the £600 per annum previously voted. It is observed that, though there were additional electric street-lamps in use (both arc and incandescent) the current returned as sold for this purpose is less than in the previous year, but the revenue is more. Evidently, therefore, no allowance has been made in connection with the restricted lighting which was in vogue more or less after September last. The average revenue per unit sold for public lamps was 3·04d. as compared with 2·55d. for the previous year; and there was a saving of about £78 on the expenditure side in connection with public lamps. The average receipt per unit sold to private consumers (which also includes public buildings) fell to 4·96d. as against 5·06d.; and the increased revenue from public lighting represented nearly £500. The average cost per unit sold, without capital charges, was 2·12d. In regard to this, it may be remarked that there was an increased revenue of nearly £210 for current sold for power, &c., at 1½d. per unit. Whatever arguments may be advanced, it is absolutely certain that current costing 2·12d. on an average can be only sold commercially at 1½d. per unit so long as there are consumers or public lamps paying higher rates. It is, of course, chiefly private consumers at 6½d. a unit who make up the loss on the lower price units, as well as pay the capital charges.

Economy and the Accounts. The accounts of the Borough of Poplar Electricity Department have come to hand; and upon them there must be congratulations to Mr. J. Horace Bowden, the Chief Engineer. As has been said before, Poplar is in an extremely good position for making excellent showing, especially on the power side; and there is no question about it that Mr. Bowden is not allowing his opportunities to slip in strengthening the financial situation of the concern. Another interest hangs about the undertaking owing to the adoption of the scheme whereby all working for it benefit by the division of certain percentages of the surplus profits [see "Memoranda" for June 1]. The units sold last year numbered 16,899,548, which was an increase of 172,843, or about 1 per cent. There was a decrease of 1,325,517 units in the amount required by the Stepney Borough Council; and in public lighting the consumption was 332,982 units less. The net income was £73,438, or an addition of £5791; while the working expenditure was £35,953, or less by £2580. The increased income and the reduced expenditure raised the gross profits for the year to £37,484, or higher by £8371, or 28·8 per cent. This is a distinctly good result, considering that the accounts include a nine months' war period. Poplar, however, has been very busy through the war; and power has helped Mr. Bowden to a notable extent. This will be seen by the following figures: Current supplied for private purposes last year 1,048,453 units, compared with 1,098,860 units; for domestic supply (this is the fixed charge on the kilowatt basis *plus* ½d. per unit) 899,018 units, as against 746,736 units; power 13,023,523 units, as against 11,284,036 units; bulk supply, 1,339,618 units, as against 2,665,135 units; and public lighting 588,936 units, as against 921,918 units. To return to the finances, after deducting interest and loans, the net balance of income over expenditure is £14,749. There are various reasons for the considerable improvement in the accounts, in view of the small increase in the total sales. The average price obtained per unit was 0·072d. more; but a heavy factor in the position was that the average price of coal delivered into the bunkers was 12s. 5½d. per ton, or a difference of 1s. 8½d., which on a consumption of 23,576 tons is equal to £2029. Then Mr. Bowden has been successful in searching for generating economy. There has been better efficiency owing to new boilers; and various other economies have been effected in the boiler-house and engine-room. The reciprocal supply with Stepney, and the close attention to the work of generation, combined to effect a saving of 2000 tons of coal, or equal to £1246. Management rather than increased business, combined with cheaper coal, has worked well to improved financial showing. As a matter of fact, the working costs were reduced from 0·55d. to 0·51d. per unit, which is a record for the Metropolitan area. Just one point as to charges. It is noticed that under private lighting 76,876 units were sold at 5d., 286,599 units at 4d., 282,019 units at 3d., 25,354 units at 2½d., 87,767 units at 2d., and 289,838 units per agreements. We pity the fivepenny, fourpenny, and threepenny unit users—seeing that the average price received under private lighting was 2·792d., and under the fixed charge *plus* ½d. per unit tariff (899,018 units were sold under this) 2·053d. The differences between these averages was 0·739d. per unit; so that if all the private lighting units had been sold under the new tariff, the income would have been £3228 less from private customers.

COAL SUPPLY IN HOLLAND.

[From a Correspondent.]

As was stated in the "Journal" for April 6 [p. 23], there has been constituted in Holland, under the auspices of the Government, the "Dutch Bureau of Coals." It was evident from the beginning that the prices of Limburgian (genuine Dutch) coals, and of German coals, though showing a heavy increase, were still considerably below the prices of English coals, though in normal times the latter form the Dutch market. Owing to this, the prices were fixed in relation to those for Dutch and German coals.

The procedure was that, in the first place, the regular consumers of Limburgian coals were allowed to have a full supply equal to their consumption in normal times. The remaining quantity of the Dutch coals was distributed among the other subscribers to the Bureau. In ordinary times, by far the greater part of the production of Limburgian coals is exported to Belgium and Germany; but owing to the export prohibition, there is a large quantity of Dutch coal available for home consumption.

There were about 12,000 consumers asking for the help of the Bureau; and, generally speaking, it may be said that the various industries secured the kinds and quantities of coal that they wanted at reasonable prices. From the regular steamship lines there was an abnormally high demand, partly owing to the increased business. For these lines, 45 per cent. of the consumption could be supplied by German coals; but for the remaining 55 per cent. there could not be obtained a supply from England at reasonable prices. At last an agreement was come to that prices should be calculated on the basis of the f.o.b. price in England, with an added settled amount for freight and costs.

In the course of April, there arose fresh difficulties, owing to Germany limiting the export of coal and briquettes, so that only 40 per cent. of the quantity of normal times was imported. The export of coke from Germany, however, remains unrestricted. The exports from England to neutral countries were also put under control; and the supply from that side became doubtful. Further, as the export of coal from Belgium to the Netherlands has not been allowed for the past two months, and all efforts to get this measure repealed have been fruitless, it is easily understood that the position of the coal supply during May was not all that could be wished. It was in these circumstances that the Bureau of Coals advised the formation of coal reserves, and the establishment for this purpose of a special Coal Reserves Company. For the formation of a coal reserve there has first to be considered the 300,000 tons of Limburgian coals, which are used mixed with bituminous coals. Secondly, a sufficiently large stock of oven-coke has to be secured for use under boilers. In the third place, the Committee know that there are in Belgium large stocks of semi-bituminous coals and briquettes, for which there is no use; so that there is ground for the hope that within a short time part of these stocks may be transferred to Holland. But for the real formation of a stock of bituminous coals, the Committee are of opinion that it is necessary to buy from America; the freights for which amount to from £2 7s. to £2 10s.

The coal reserves for the gas-works are to be formed from Belgian gas-coals, bituminous coals from Charleroi, and, thirdly, from

American bituminous coals. Considering all the circumstances, the formation of coal reserves will be a costly affair. The stocks are not necessarily to be of huge dimensions. A stock sufficient for five or six weeks' supply for the various industries will suffice; and during the time that the position is darkest and the works are consuming the stocks, fresh sources of supply may be found.

As to the question of costs, the Company is regarded as a co-partnership society. The working capital is taken at £25,000, in shares of 100 Dutch guilders (£8 6s. 8d.). Each share gives a right to 100 tons in the coal reserve. But as this capital is too small to allow for serious working, each contractor is obliged to take the coals for which he bargains, and also pay in advance the amount that may be involved in the price of the coals. For gas coals, the amount per ton that has to be paid in advance is 18 guilders (about £1 10s.). All gas-works, private or municipal, may take part in the Coal Reserves Company; but at the signing of the contract they have to fix the quantity of coals for which they will be responsible, and then they have to take the corresponding number of shares, and have to pay also in advance the amount for this tonnage.

During the last week of June, a meeting of the new Company took place, under the chairmanship of the President of the Bureau of Coals (Professor Ts de Vooys), and in the presence of the Minister of Industry. In the time that elapsed between the preliminary negotiations and this meeting, circumstances somewhat changed, as was pointed out by Heer Ribbins, the Manager of the Delft Gas-Works. English coal importers now guarantee the supply of fully 100 per cent. of the contracted coals; and now Italy has begun war with the Central States, Germany has raised its import to Holland from 40 up to 80 per cent. of the normal quantity. Nevertheless, the President insisted on the formation of stocks. It will take some time—say, six months—ere the whole quantity will be delivered; and there is, therefore, no time to be lost. The coal reserves are to be delivered directly to the contractors unless they prefer the Company to take care of them, in which case the cost of storage has to be provided. In the course of the proceedings, the representative of the German Syndicate stated that they had no intention of raising the prices of coals to make extra profits—which assertion was warmly applauded. The result is that the Coal Reserves Company has been established, and that it will work in connection with the Bureau of Coals, under control of the Government. The representative of the gas industry is Heer J. van Rossum du Chattel, of Amsterdam.

COKING AND BYE-PRODUCTS.

By "Event and Comment."

THE PRODUCTION OF GOOD COKE.

WHAT actually happens in a bye-product coke-oven during the time in which the coal is being converted into coke is comparatively little understood. Many factors are operating; but the process of producing the coke, being a matter of daily routine, is too often only regarded superficially without any attempt to distinguish the effect of certain variations in the process. It is well known that different classes of coal must be treated in different ways in order to produce the best quality of coke. In some cases, slow heating and a moderate temperature give the best results; while in others rapid heating and a high carbonizing temperature are required. There are times on every coke-oven plant when the heat of some of the ovens is below normal. It must follow, therefore, that if such an oven is charged in the usual way, the conditions during the carbonization of the particular charge will be quite different from what they usually are; and if the resultant effect on the coke were noted, it would be seen that the appearance and structure of this particular batch of coke were quite different from the normal. The same reasoning, of course, applies to the quality and quantity of the bye-products, only in this case the effects have been thoroughly investigated, and definite conclusions arrived at. What generally happens on a coking plant is that the bad oven is charged as usual, and an attempt is made to regain the heat during the carbonization. It might be that the oven is charged a little lighter than usual, and this enables the heat to be regained more quickly. In the writer's opinion the best method is to leave the oven empty until such time as the walls regain their proper temperature—assuming, of course, that the temperature is that at which the best coke is produced. When leaving an oven empty in this way and the gas burning in the flues, it is essential to watch the walls very carefully in order to avoid over-heating. Another reason why this method of regaining the heat is more satisfactory than either of the two others mentioned is that the ultimate effect on neighbouring ovens is better. It follows, of course, that when one oven is filled with wet coal it has a distinct cooling effect on the adjacent ovens. This applies more particularly in ovens which have only one set of heating flues between two ovens. In such ovens as the Semet-Solvay, where each oven has its own two sets of flues, the effect is not so marked. The aim should be, therefore, to have every oven at approximately the same temperature before charging. If this is done, there will be greater regularity in the burning periods, provided approximately equal charges are given, and that the gas and air supplies to each set of flues are properly adjusted.

The preparation of the coal before charging is an important factor in the production of good coke. As a rule, blast-furnace managers are quick to draw attention to an unduly high ash content, because they do not like paying coke price for ash, apart from any other deleterious effect on their furnaces. At the same time, this point must also be watched on account of its effect on the quality of the coke. Some classes of coal which will produce good coke as long as the ash content is below about 5 per cent., will only yield inferior coke if the ash rises to 7 per cent. The general rule nowadays is that coal containing more than 25 per cent. of volatile matter shall be compressed before it is charged. By means of compression the bulk of a given weight of coal can be reduced by about 15 to 25 per cent., in consequence of which a denser coke is produced and to some extent the caking power is assisted. About 10 per cent. of water is added to assist in the cohesion of the coal, but if too much water is added the coking period is unduly lengthened. It can generally be assumed that for every additional 1 per cent. of water added the coking period is increased by about 3 to 5 per cent. In the case of uncompressed coal, however—*i.e.*, coals containing only a low proportion of volatile matter—the effect of a little additional moisture is much more marked, and with such coals may amount to 10 per cent. longer time for each 1 per cent. of moisture. The size of the coal also has an effect on the nature of the coke. The coal should be as even as possible, and for this reason it is becoming almost general to instal a coal-crushing plant in connection with bye-product coke-ovens. The size of the coal also has an effect on the ultimate porosity of the coke. According to some authorities, the finer the coal, the denser the coke, and *vice versâ*.

It must always be remembered in connection with bye-product coking that the users' point of view is usually the one to be considered. The blast-furnace manager has to use the coke, and his experience soon teaches him what qualities he looks for and also what he likes to avoid. Generally, if a high temperature is required in the furnaces, dense coke is required, because with this less reduction of the carbonic acid to carbon monoxide takes place. The moisture content of the coke is very important, and great care is necessary in carrying out the quenching of the hot coke from the ovens. One of the most important points in this connection is to accustom the responsible men to making the requisite allowance for the difference between the appearance of hot coke in the day time and at night. Coke which appears to be perfectly quenched in daylight will appear red hot at night; and hence the tendency is rather to overdo the quenching at night time. If the coke contains too much water the combustion temperature in the furnace is much decreased—due to the heat required to raise the steam to the temperature of the furnace.

SIXTY YEARS AGO.

From the "Journal" of July, 1855.

Proceedings against Gas Companies.—It would appear that public opinion is running very strongly against gas companies at the present day, and that they are destined to become Ishmaelites in our strange society. Everybody's hand is against them. They are attacked in a wholesale manner by the Government officials; in detail, by all manner of vexatious prosecutions. Formerly it used to be said that bodies corporate [in law] had "neither souls to be saved nor seats of honour to be kicked"—they were held to be intangible, and to have no conscience, in fact. But now the tables are turned. The public has shaken off its conscience, so far as companies are concerned; and, if the slightest opportunity be furnished, it really appears that they are considered fair objects of plunder. And yet the capital invested in public companies, whether gas, or water, or canal, or railway, is as much private property as any other; and the systematic leaning of the Bench against companies, whenever they are so unfortunate as to appear in court, and the universal tendency to extort from companies, which exists to so notorious an extent, are as great injustices when brought to bear against them as if they were brought to bear against private persons.

The hardship, so far as the gas companies are concerned, is practically the greater in consequence of the prejudices lately created against them by the sanitary empirics in the pay of the Central Board of Health. Whatever harm they may produce, whatever annoyance they may occasion, has been so systematically exaggerated by the [would-be] scientific authorities, that the public has almost been led to consider gas-factories to be intolerable nuisances, and the sources of every conceivable evil. The unscrupulous manner, moreover, in which the gas companies have been accused of monopoly and spoliation, appears to have produced the impression that there was a species of rude retributive justice in plundering them. The consequence has been that everybody's hands are against the gas companies; and there is a manifest desire to throw upon them responsibilities to which they are by no fair means liable. The most dangerous anomaly arising from this indiscretion of public opinion is, however, to be found in the notorious leaning of the Bench in favour of every individual who appears in court against a company. This prejudice, be it observed, is not confined to the companies which exercise the [so-called] offensive trades. All such bodies suffer from it to a greater or less extent; but inasmuch as the gas companies are brought more frequently, and more directly, in contact with the every-day occupations of society, they are made to suffer from its effects the most severely.

BRITISH COMMERCIAL GAS ASSOCIATION.

Membership Campaign in the Midlands.

The service which the British Commercial Gas Association are rendering to the industry was explained at a meeting summoned by the Midlands District Committee and held at the Grand Hotel, Birmingham, last Thursday afternoon. Representatives of non-subscribing gas undertakings had been invited; and there was a good attendance. Sir Hallewell Rogers, the Chairman of the Gas Committee of the Birmingham City Council, presided at the opening of the proceedings; and he was supported by Captain Hilton (the Secretary of the Birmingham Corporation Gas Department, who is now acting as Secretary of the local Munitions Committee), Mr. J. Ferguson Bell, of Derby, and the Secretary of the Association (Mr. William M. Mason).

Mr. Ferguson Bell, who is Hon. Secretary of the Midlands District Committee, congratulated the meeting upon having Sir Hallewell Rogers in the chair. They looked upon Birmingham as the worthy capital of the Midlands; and they were delighted to have the support of one of the largest and most progressive gas undertakings in the country. He mentioned that he had received apologies for non-attendance from numbers of those to whom invitations had been sent. Nevertheless, he was pleased to see so representative a gathering.

Value of the Work of the Association.

Sir Hallewell Rogers said he was glad so many Midland gas companies and corporations were represented at the meeting. When he was asked to accept the presidency of the Midland District Committee of the "B.C.G.A.," he felt it his duty to comply, because the Birmingham Corporation gas undertaking, which was one of the largest in the country, had undoubtedly benefited by being members of the Association, notwithstanding the fact that they had a very large commercial staff who were giving the utmost publicity within their own area of supply. In homely words, they had sampled the medicine and had found it very good and beneficial. He had no hesitation, therefore, in asking others to sample it, too. It must be to the great advantage of an industry like theirs to combine together throughout the country in a national movement of this kind; and he hoped the result of the present meeting would be that many undertakings in the Midlands not already members would see their way to join. From a business point of view, he assured them that the money they subscribed would be well spent. Although he was nominally one of the members of the Committee, he was unable to take any active part in the management. He congratulated the Association on the satisfactory results obtained by the efforts of the management, and more particularly of the energetic Secretary, Mr. Mason. Mr. Ferguson Bell, the Hon. Secretary of the Midlands District Committee, who was well known to them as the able Manager of the Derby Gas-Works, would no doubt be able to prove to them the advantages to be derived by every gas undertaking in the Midlands becoming members of the Association. The gas industry of the country had been able to render most valuable assistance to manufacturers engaged in the production of munitions of war, and in placing before the public generally the advantages and economy of gas usage, both in the workshops and in the home. Notwithstanding the increased knowledge which the manufacturer had of the capabilities and possibilities of gas for industrial processes, the Association had, by their excellent advertisements in such papers as the "Engineer," "Engineering," and other trade journals, been able to bring home the value of gas when applied to various heating problems, and at a time when the majority of gas engineers had been engaged in other duties which would prevent them giving any time to the preparation of advertisements of this special kind. During the past three months, they had received seventy inquiries through the Association in response to their advertisements relating to the industrial uses of gas; and when he told them that among these inquiries were the names of some of the largest manufacturing concerns in Birmingham, they would realize that the advertisements inserted in the various daily and weekly newspapers had caught the eye of the right people, and those whom the advertisements had been designed to attract. Occasionally they found that architects and consulting engineers, as a result of noticing the Association's advertisements, had gone to them for information and advice, although the same inquiries would not come to the members individually. The consequence was that they had got into touch with those who were seeking information, and had been able to advise them. The value of the advertisements in daily papers was fully recognized by all progressive business organizations; and the fact that many Government departments had adopted newspaper advertising in connection with recruiting for the Army, for munition workers, and for advertising the present War Loan, confirmed the action of the Association in maintaining the publicity campaign for gas. At the present time it was necessary for every citizen in the United Kingdom to practise the strictest economy both in manufacturing premises and the home. This it was possible to do in many cases by the application of gaseous heating. For many years scientists and others had raised their voices against the national waste in using coal for heating purposes, whereby valuable bye-products were lost by passing through chimneys, causing loss of health giving sunlight and the blackening and destroying of many valuable buildings in towns and cities. Surely no more opportune time than the present could be chosen for instilling into the minds of the public many of the economical advantages of gas. The value at the moment of the bye-products of coal through distillation was well known to them all; and the larger the consumption of gas by the public, the greater should be the contribution of the various gas departments to the manufacture of high explosives. Notwithstanding the increased charges for gas—and, owing to the advanced prices for coal, gas undertakings had been obliged to revise their charges—they could still claim that, even at its present level, gas was the most economical fuel at the present time. With the present shortage of labour in both domestic and industrial circles, the adoption of labour-saving gas appliances might rightly be advocated in the interests of national economy.

Local Publicity.

With regard to local publicity, this was a direction in which the Association were helping the subscribing undertakings by providing suitably written articles, thereby saving a good deal of the gas manager's time. Only that week they had an inquiry which had been addressed to the Association as a result of noticing an advertisement in "Education," in which the writer stated she was a teacher of domestic science, and asked for information on the subject of the destruction of house refuse by means of gas-heated incinerators. The local publicity undoubtedly tended to increase the gas consumption in the areas in which the advertisements were circulated. In the case of the Birmingham papers, they circulated within a radius of 25 miles of the city; and it was only fair that those gas undertakings which undoubtedly obtained benefit from publicity of the kind should contribute proportionately to the funds of an Association which was carrying on the work. Birmingham had joined the Association, and they were very glad they had done so. He believed that combined effort of this kind would strengthen the gas industry generally.

The Secretary, at this point, said he thought perhaps the best way to raise discussion, and put before the meeting a clear statement of the case for the Association, would be if he read some observations prepared by Mr. Goodenough, on the occasion of the recent meeting at Blackburn. Having read extracts from this speech, much of which was reported in the "Journal" published on the occasion referred to, Mr. Mason concluded by emphasizing the following remarks made by Mr. Goodenough:

> The number of subscribing undertakings is now more than double what it was when the work was begun; and it represents fully 80 per cent. of the gas industry measured by the sale of gas. Furthermore, the experience of all the makers of gas apparatus, whether for the manufacture or for the consumption of gas, has convinced them that the Association is doing much to stimulate the output of gas appliances and the sale of gas, and that consequently it is worth their while to contribute substantial sums towards the cost of the national advertising campaign.
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> The Association has become, and is becoming in an increasing measure, a valuable bureau of information for every subscribing member. It is in touch with the industry all over the country, and is able at once to get for every subscriber the experience and knowledge of any or all of its members to help him in any difficulty that he may encounter.
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> The Association has also constituted itself a vigilant defence organization for dealing with any attacks made upon the gas industry either through ignorance or malice. It is, however, in no sense an anti-electric organization—that is to say, it does not set out to injure the business of its competitors or to attack them in any way. All that it does is to controvert any statements that find their way into the Press which are calculated to injure the gas industry and are without foundation. The Association has succeeded in effecting its object in this direction, and has pursued its publicity campaign without rousing any hostility in the electrical world. The advertising work done has been directed more particularly to pushing the sale of gas as a fuel—a field in which there is a rich harvest to reap now and in the years to come.
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> Then, again, the Association has done valuable work for the industry as a research organization, especially in regard to the hygiene of gas lighting, heating, and ventilation.
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> The Executive attach very great importance to the Association's work in stimulating new business methods. Although flourishing in some quarters before the advent of the Association, and already springing up in other quarters in recent times, new methods are still badly needed in many places; for there are very many administrators of gas undertakings who still need to realize that salesmanship is fully as important as manufacture—that supply must follow demand, and, therefore, the creation and maintenance of demand is the prime essential. Salesmanship, in the true sense of the word, is the foundation and stay of every business. In the term "salesmanship" I do not by any means include only canvassing, advertising, and selling in the show-room. I include, as of vital importance, efficient service to the consumer in every shape and form. The gas industry, to ensure permanent prosperity, must come to rely entirely upon efficient service to the public, and not upon its monopoly rights of supply. Efficient service is the only way to secure permanently-satisfied consumers; and every satisfied consumer is in himself a most effective means for securing others. If every gas undertaking could count upon each customer as a satisfied friend, and not as one who uses just as little gas as he can, and even then pays the account with a very bad grace—much would have been done to ensure permanent prosperity. We have to realize that we make our money out of our friends, not out of our enemies, who will not deal with us if they can help it. Success comes from mutual service—the better the service rendered, the greater the ultimate reward.
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> More than ever now does the industry need to realize that expert

> salesmanship—expert shopkeeping, if you like to put it so, and as you must put it if you are to get the right point of view—must take the place everywhere of the obsolete, but by no means defunct, policy of "take it or leave it." I say that such new business methods are needed more than ever now because the war is making, and the after-effects of the war will make, it more and more difficult to produce cheaply, and is causing, and will cause, everyone to exercise economy in consumption. It will, therefore, be more and more difficult to sell unless the best methods of salesmanship are adopted. One of the best ways in which the gas industry can combat the rising cost of manufacture is, obviously, to secure increased business over which to spread the standing charges. It will, indeed, be for the good of the nation, as well as of the industry, that new business methods should be adopted, and the advantages of modern gas appliances brought as effectively as possible to the notice of the public, as such appliances make for both domestic and industrial economy; and economy is what everyone of us is now striving to attain in every direction. Only by the persistent and untiring efforts of the business men of the country can the difficult conditions created by this war be discounted. It has well been said that "the eternal unrest of the business man is the source of national prosperity," and this spirit of unrest needs to be cultivated, both within the gas industry and outside it, to-day more than at any previous time in our history.
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> The Association stimulates, also, by the holding of conferences, both district and national, at which papers are read and discussions take place upon salesmanship problems and new methods of securing and retaining business; also by correspondence between the members and headquarters; and by the meetings of the Executive and General Committees, at which valuable discussions constantly take place. All this is helping to spread the spirit of modern salesmanship, founded upon good service to the consumer and the satisfaction and confidence of the consumer issuing therefrom.
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> The work of the Association is undoubtedly bringing about a general re-vitalizing of the whole industry; there is a stirring of the dry bones in the valley; self-criticism is taking the place of self-satisfaction, energy the place of sloth, knowledge the place of ignorance, and the spirit of service that of an attitude of superciliousness.
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> I am certain that once they realize what has been, and is being, done by their neighbours and other undertakings (both company and municipal) up and down the country for the benefit of every gas undertaking between Land's End and John O' Groats—and not only in this country, but in the Overseas Dominions, where our work is already recognized by subscriptions from Canada, New Zealand, South Africa, Australia, and, indeed, all parts of the British Empire—the non-subscribers in every country in the kingdom, will, without hesitation, and without an exception, enrol themselves in the Association and become its staunch supporters.

When reading the extracts, some of which are given above, Mr. Mason broke off at one point to make a remark which was received with the heartiest approval—that the greatest asset of all which the Association possessed was the man who wrote what he had just read—Mr. Goodenough—to whose energies and leadership much of the success of the Association was due.

How Birmingham has Benefited.

Captain Hilton said he was perhaps a little bit out of touch with his own job at the moment, but he could not help thinking that, even in connection with toluol and also shell and ammunition making, he could still perhaps be of some slight service to the gas industry. The question of toluol was essential to the provision of shells. If he said a word about the application of gas to the turning out of shells and fuses, which were so absolutely essential to the needs of the Army, it might be of some slight interest. In connection with the enormous manufacture of shells at Birmingham, he thought in all cases gas-furnaces were being put down for nosing them. In one very large works in the City, he had seen a furnace made by Messrs. John Wright and Co. (their local manufacturers); and the work of the furnace was entirely on shells. In other cases, such as the melting of metal for fuses and adapters and other things necessary in the turning out of ammunition, gas was playing a very important part. If it had not been for the very prompt way in which the gas people took the matter up at the time when the ammunition question loomed very large, there would not even have been the progress that had been made so far. He had come into close touch with Woolwich and the Munitions Committee in London, and he had been able to push gas a little bit with them in regard to specifications they sent out to manufacturers. Speaking of how they in Birmingham had benefited, he mentioned, quite irrespective of what they had done since the war began—which was simply enormous in the way of putting down new plant for ammunition work—that he was officially informed that there was a possibility of an output of at least 500 million cubic feet of gas per annum on munition appliances. In all these things the Association could help, and had helped, them by advertisements, and by the general feeling that consumers now had that they could get some advice which was helpful to them, as well as helpful to the gas industry, from their local gas undertaking, whether it was a corporation or a company.

Vote of Thanks to Sir Hallewell Rogers.

Sir Hallewell Rogers at this point of the proceedings said he would have to leave, as he had another meeting to attend. He expressed the hope that the outcome of the meeting would be that many non-subscribing undertakings would ally themselves with the Association.

Mr. Hubert Pooley (Leicester) proposed a very hearty vote thanks to Sir Hallewell Rogers for his attendance.

Mr. T. Berridge (Leamington) seconded the motion, which was carried.

Derby Gas Company's Valuable Investment.

Mr. Ferguson Bell then took the chair, and mentioned that the Derby Gas Company was one of the first subscribers to the Association. When he presented the bill for the renewal of their subscription for the present year, the Chairman of the undertaking said he believed they got full value for the money they paid, and that it was one of their most valuable investments. The Association were doing a work that no individual gas company could do. The system of co-operative advertising was a great advantage, because none of them could take up any of the papers —"Punch," "Illustrated London News," "Graphic," or many other journals—without seeing the Association's advertisements. They were prepared by advertising experts in a very pleasing way. Articles appeared from time to time in ladies' journals, which all helped their business. He repeated what he had said on previous occasions that if the gas industry ever fell on evil times it would be because of their want of business acumen. In the past, gas had largely sold itself. Until the last few years it had had no competitor. Now, however, they had a strenuous competitor in electric light and other forms of energy; but he believed that if the gas industry kept its business forward and worked on business lines there was no reason why it should not continue to prosper. He was particularly struck by a paper read by the Engineer of the Bergen Gas Company at the Liverpool Institution meeting, in which he explained how cheaply electric light could be obtained in the town owing to the fact that current was generated by means of a waterfall. That being so, it might be thought that the Bergen Gas-Works had fallen on evil times. Yet, notwithstanding this severe competition, the Engineer stated that the consumption of gas had doubled during the last few years. At Derby, the Corporation had had the electric light for about 18 or 19 years, and during this time the gas consumption had multiplied by 2½; and there seemed to be just the same experience wherever one went. It was necessary that they should keep the public well informed as to what gas could do. Mr. Watson had asked whether they were all satisfied that each of their consumers was using as much gas as he might. They did not want a consumer to use any more gas than he was absolutely satisfied he was getting value for his money. When they remembered that they subscribed to the Association at the rate of 2s. 6d. per million cubic feet sold, it meant that they were paying one penny per consumer per annum, which he thought they would agree was a very small tax. An instance had been mentioned to him of the Local Government Board objecting to the payment of the Association subscription; but when it was explained that the amount was a reasonable expenditure for co-operative advertising, the auditor immediately said it was a fair trade charge and passed it. The B.C.G.A., however, went further, and said to local authorities: "If you are surcharged, we will refund the money."

Stafford More than Satisfied.

Alderman Westhead (Stafford) said he thought the Stafford undertaking, which was a small one, had been a contributor to the Association practically from its commencement. There had never been any question in their minds, when the subscription fell due, as to whether or not they should renew it. It had always been renewed with the greatest pleasure, because they looked upon it as one of the best items of expenditure in their accounts. They did a certain amount of local advertising as well as renewing their subscription to the Association. But they were more than satisfied that the money they paid to the Association was repaid in the benefit they derived from their connection with it. Considering the population of Stafford, he thought they were one of the largest gas consumers per head of the population in the district. Therefore, comparatively, their subscription was a large one; but they were eminently satisfied with the value received from the Association's advertisements.

Excellent Value at Cheltenham.

Mr. James Paterson (Cheltenham) regarded the argument in favour of the Association as so overwhelming that he did not think any valid argument could be brought against it. In Cheltenham they were getting excellent value for their subscription, and there was not the slightest doubt that proof was forthcoming that a large number of undertakings in the district had obtained immediate value from the advertisements. In Cheltenham the sales of gas-fires, which before the advertising were represented by 100, had risen to 170, or nearly double, after the advertisements. If the improvement was not due to advertising, he did not know what the determining cause was. The advertisements of the Association stimulated the public mind all over the country; and it remained for the local authorities and companies to take advantage of this help. In his district they advertised the price of coke for a short period in a local paper, and at the end of this time had sixteen or twenty new customers. They repeated the advertisement subsequently, and more than doubled the figures.

Burton's Appreciation.

Mr. Tarvar, the Deputy-Chairman of the Burton Gas Committee, said they subscribed to the Association and very much appreciated everything done by the Association in the shape of advertising, not only in the public Press, but also the pamphlets, posters, and other literature which was sent round to subscribers. It was very useful indeed. It helped their business—brought it before the public; and since they had been members of the Association the gas consumption had largely increased. In

Burton they had opened very extensive show-rooms since the formation of the Association, all of which helped considerably in the consumption of gas.

Hopes at Walsall.

Mr. Venables, the Chairman of the Walsall Gas Committee, expressed his pleasure at hearing the strong evidence in favour of the Association. The question of subscribing to the Association had been brought before his Committee on several occasions by their Engineer; but, he was sorry to say, without any effect. They had a resolution on their books postponing any donation to the Association for a certain period. Lately, however, certain periodicals and literature distributed by the Association had been placed in his hands, which he had carefully read; and he went to the last Committee meeting with the intention of moving that they should subscribe to the Association. Like himself, most of the Committee had forgotten the existence of the resolution which he had mentioned; but it was brought to their notice by the Town Clerk, and, of course, they could do nothing until it was rescinded. At the first possible moment that he could move his Committee in favour of the Association, he should certainly do so.

Leicester Subscribes the Full Amount.

Mr. H. Pooley (Leicester) mentioned that in the last two years his Committee had subscribed the full amount to the Association. The spending of one penny per consumer per annum on advertising seemed to him a ridiculously small amount. At the same time, the bulk sum sometimes looked rather large. But if they regarded it in relation to the output of their undertakings, what they subscribed was very small indeed.

The Art of Advertising.

Mr. George Helps (Nuneaton) said what he came chiefly to see were heretics [laughter]; but they did not seem to have any. He thought they would have been attacked by those people who not only stood out, but stood out on very good grounds. It seemed that there were no such people existing in the district, or, if they existed, they had not attended the meeting. That day they were talking about gas and what it would and would not do; but there was a very small percentage indeed of them who knew anything at all about it. [Laughter.] They sent out all sorts of appliances, expecting their men to put them in and keep them in order so as to give good service; and they did not know what they ought to know about the apparatus. The Association's system of advertising emphasized the right and showed up the wrong; and nothing but good could accrue. There was a very great art in advertising; and to get that art cost a lot of money. The Association seemed to be able to get just the art that was required. There were very few advertisements turned out by the Association which had not been of the greatest use.

Press Articles at Wellingborough.

Mr. J. T. Lewis (Wellingborough) testified to the value of the Association, and said it was a great pleasure to him to see their subscription going up on the full basis. It was satisfactory to mark the increase in the subscription, because it showed that the output was enlarging too. The Association had provided him with at least half-a-dozen articles dealing with gas and gas apparatus, which he had been able to get into the local Press at very reasonable prices.

A Discordant Note.

Mr. Vincent Hughes (Smethwick) said he would much prefer to have made the criticisms of the Association he had to offer privately to the Chairman rather than in the presence of the meeting, because he feared what he had to say might discourage the Chairman of the Walsall Committee and others who were hesitating. But he had been invited to express his views; and he must do so. At Smethwick they had been subscribers to the full amount nearly since the commencement of the Association. A great deal had been said as to the benefits to be derived from subscribing to the Association. His experience was that they thought they could trace during the last few years one gas-fire and a water-heater as having been sold through the advertisements of the Association. This was a very noble record! No one questioned the advisability or advantages of advertising—it was the method of advertising that wanted somewhat amending. Mr. Mason had stated that one-third of the amount subscribed was spent in the district from which the subscriptions came. But they failed to trace scarcely a penny being spent in Smethwick by the Association. Something had also been said about posters; but they had never had a poster sent to Smethwick.

The Chairman: That is your fault.

Mr. Hughes replied that it was not. He asked the Secretary if he could say that he had sent a single penny to Smethwick in the form of advertisements.

Mr. Mason: Yes; to Birmingham.

Mr. Hughes: We are among the large undertakings of the Midlands, and we certainly think we ought to have some kind of compensation. We are absolutely ignored.

Good Advice.

Alderman W. H. Goodyear, Chairman of the Smethwick Gas Committee, said he knew the value of advertising, and that 95 per cent. of the commercial undertakings of the country depended upon it for the sale of their goods. For his own part, he heartily approved of their gas undertaking being a full supporter of the Association's scheme. He hoped that if there was anyone in the room who was hesitating he would not do so any longer, but would join before he left.

A Non-Subscriber's Tribute.

Mr. B. W. Smith (Walsall) stated that, although non-subscribers, he and his Committee had received great benefit from articles and literature which he had been able to procure. They had saved him a vast amount of time, and he had been able to adapt certain advertisements supplied by the Association to meet his own requirements. This, he thought, spoke a great deal for the utility of the Association. For a long time he had been strenuously endeavouring to get his Committee to join the Association; and he was hoping, from the remarks his Chairman had made, that the time had now arrived when probably they would be coming in.

Effective Posters at Tamworth.

Mr. W. A. Sapey (Tamworth) added his testimony as to the use and advantages of the Association. Last year, through Mr. Mason, letters from various local people who had written asking for information on matters mentioned in the Association's advertisements were sent direct to him. During the past twelve months he sold, mainly through the Association, thirty gas-fires and about eight or nine water-heaters. This was fairly good business for their subscription. With regard to the placards, they had bought some, and found them very good advertisements.

The Indirect Results of Advertising.

Mr. Rogers, speaking as a neighbour of Smethwick, and as one who dealt with most of the advertisements in connection with the Birmingham Gas Department, asked Mr. Hughes to look at the return he obtained from a rather different standpoint. If he (the speaker) tried to trace the actual number of gas-fires or water-heaters directly sold as a result of the advertisements, he was afraid he should say that they could not support the Association. But he contended that this was not the right way to look at the matter. They must look at the advantage they gained from the continual advertising. To his mind, local advertising, combined with national advertising, well repaid the money that was expended upon it.

A Difficulty Overcome.

Mr. H. E. Copp (Etruria) gave an instance of how he had benefited by the Association. The Water Company refused to allow any water-heating apparatus to be fixed in conjunction with their water supply without a large tank with a capacity of 60 gallons being installed at the top of the house. This ruled everything out. He wrote to Mr. Mason, who discovered other places with the same difficulty. Mr. Mason made certain suggestions to him, which entirely overcame the difficulty.

Results at Stafford.

Mr. W. M. Valon (Stafford) said the value of the Association was not only in the advertising, but in the fact that it centralized things and helped them in any difficulty. If they communicated with the Association they would get immediate assistance. Mr. Hughes, in looking for the amount of benefit he had derived from the Association, was like a man who had dropped his purse in the street in the dark and was looking for it without a light. In the last few years Smethwick had had an immense increase in output; and the question was how much of it had been indirectly due to the Association. As to money being spent locally, he said it was not so much a matter of getting new consumers. Take their own case in regard to cookers. They had already got 94 per cent. of the consumers using cookers; but they believed there was good room for another 6 per cent. During the last few years, since they had been using the regular consignments of literature sent to them by Mr. Mason, and for which they paid, the average rate of consumption per head of the population had increased marvellously. There was no doubt that direct benefit was to be obtained from the Association. Another point was that, even if they did not join, they would still get some benefit from it. Lately they had all come to the conclusion that it was not right to receive benefits and not pay or help towards getting them; and on this ground alone everyone now standing out ought, as an honest man, to pay something to the Association for the indirect benefit he was now deriving from it.

The Association and Expert Advice.

Mr. Thomas Berridge (Leamington) spoke of the expert advice on nearly all subjects which was available through the Association, and said that in the matter of defence if they were attacked by electricity or petrol gas they had everything prepared for them. He proposed a resolution approving of the aims, objects, and policy of the Association.

Mr. F. W. Stevenson (Coventry), in seconding the motion, said that in the past people who wanted gas appliances, especially for works use, applied too much to different makers. The makers' object, of course, was to sell their apparatus. Now it was possible to get from the Association information and tests as to what was the best system and apparatus. The Coventry Corporation were full subscribers. Many times they had written to Mr. Mason and received valuable information from him.

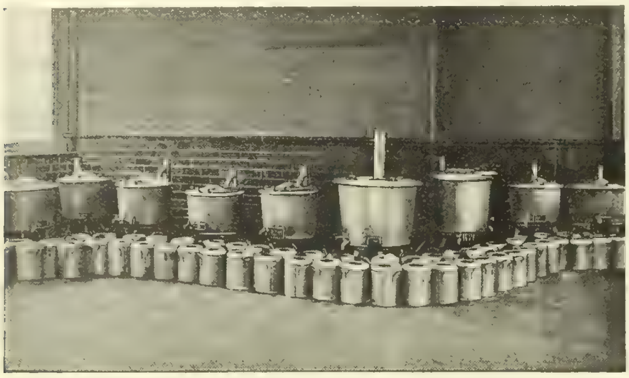
The motion was passed.

Vote of Thanks.

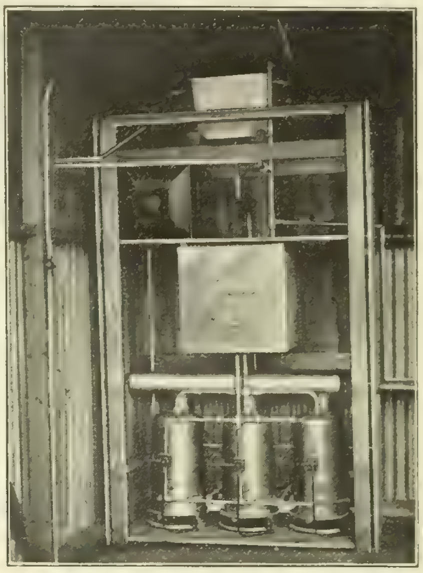
A vote of thanks to the Chairman and Secretary, to which Mr. Mason briefly replied, closed the proceedings.

GAS SERVICE IN WAR TIME.

The services rendered by gas have shown themselves to be inestimable under all conditions of life; but perhaps in no case have they proved greater than during the present war, in connection with the military hospitals and other establishments which have been brought into being throughout the country. From time to time opportunities have presented themselves of publishing particulars and photographs of gas installations of this character for heating and cooking purposes; and to the information already given may now be added some details and illustrations supplied by the Richmond Gas Stove and Meter Company.



Battery of Richmond Company's Gas-Boilers.

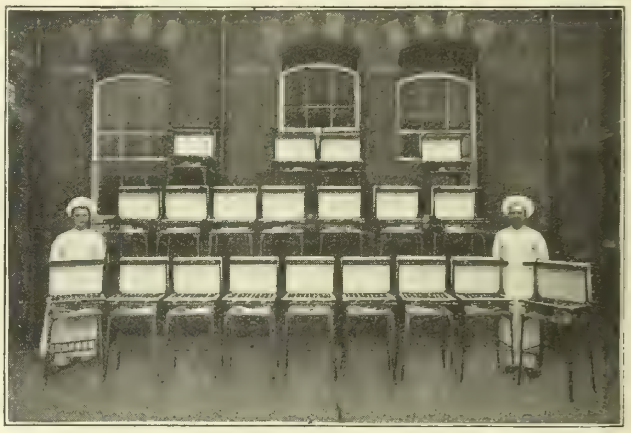


"Ironclad" Circulators at St. John's Hospital, Cheltenham.

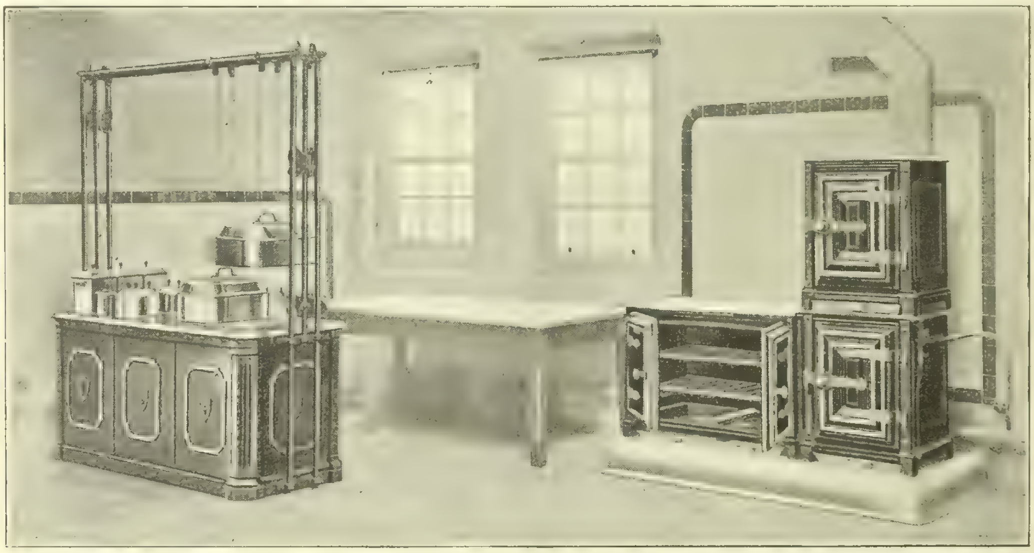
One of the photographs shows a battery of Richmond boilers of a total capacity of 240 gallons, supplied to the 2nd Battalion Cheshire Regiment, and used for boiling water for tea, cooking vegetables, boiling meat, puddings, &c., for about 200 men. The urns which will be noticed in front are for the purpose of carrying the boiling water to the various tables for making tea. Next there are illustrated a battery of three of the firm's "Ironclad" circulators, fitted by the Cheltenham Gas Company at St. John's Hospital, Gloucester Road Schools, Cheltenham. They are employed chiefly to supply hot water for washing-up purposes, and the installation has given the authorities at the hospital entire satisfaction.

A view of one portion of the kitchen at the Royal Victoria and West Hants Hospital, which is now being used as a War Hospital, shows cooking under ideal conditions.

Last, there is part of a consignment of Richmond "Bungalow" hotplates on stands, with plate-racks and wall-plates, which have just been delivered to the Norwich County Asylum, a portion of which has been taken over by the military authorities, and will be known as the Norfolk War Hospital. It is one of the largest in the country, and provides 1500 beds. One of the hotplates illustrated is being fitted in every ward for the nurses' use, as an auxiliary to the cooking installations in the main kitchen.



Hotplates on Stands at the Norfolk War Hospital, Norwich.



PART OF THE KITCHEN AT THE VICTORIA AND WEST HANTS HOSPITAL, BOSCOMBE.

Institution of Heating and Ventilating Engineers.

At the summer meeting of the Institution, which was held recently at Leamington, it was resolved that immediate steps be taken to fix certain standards for the use of the trade generally, and the members of the Institution in particular, and that action be started to make it known to architects, consulting engineers, municipal engineers, and others, that the Institution have approved and adopted these standards: (*a*) Co-efficients for heat losses from glass, walls, ceilings, floors, air changes, &c. (*b*) Method of calculating the total surface in square feet of glass, walls, ceilings, floors, &c., bearing in mind that losses occur through all substances in every direction, and that heat must be provided to cover all such losses. (*c*) Cubic contents of room and number of times the air has to be changed per hour. (*d*) Formulæ for ascertaining the amount of radiation or pipe surface required to meet such losses, with (say) temperature of room 60°, temperature outside 30°, temperature of water 160° Fahr. (*e*) Diagrams or comparative tables for any other temperatures, to facilitate the testing of plants under varying atmospheric or climatic conditions. (*f*) Boiler rating for heating plants, and for hot water supply plants. (*g*) Proportions of boiler power to storage capacity. (*h*) Data sheets or other formulæ for general use in the heating trade. (*i*) Form of tender, with specification of the system, terms of payment, maintenance, &c.

THE NEW GAS-WORKS AT BUDAPEST.

By M. Isidor Bernauer, the Manager.

[Abstract-Translation of a Description in the "Journal für Gasbeleuchtung" for May 8, 15, 22, and 29.]

(Continued from p. 24.)

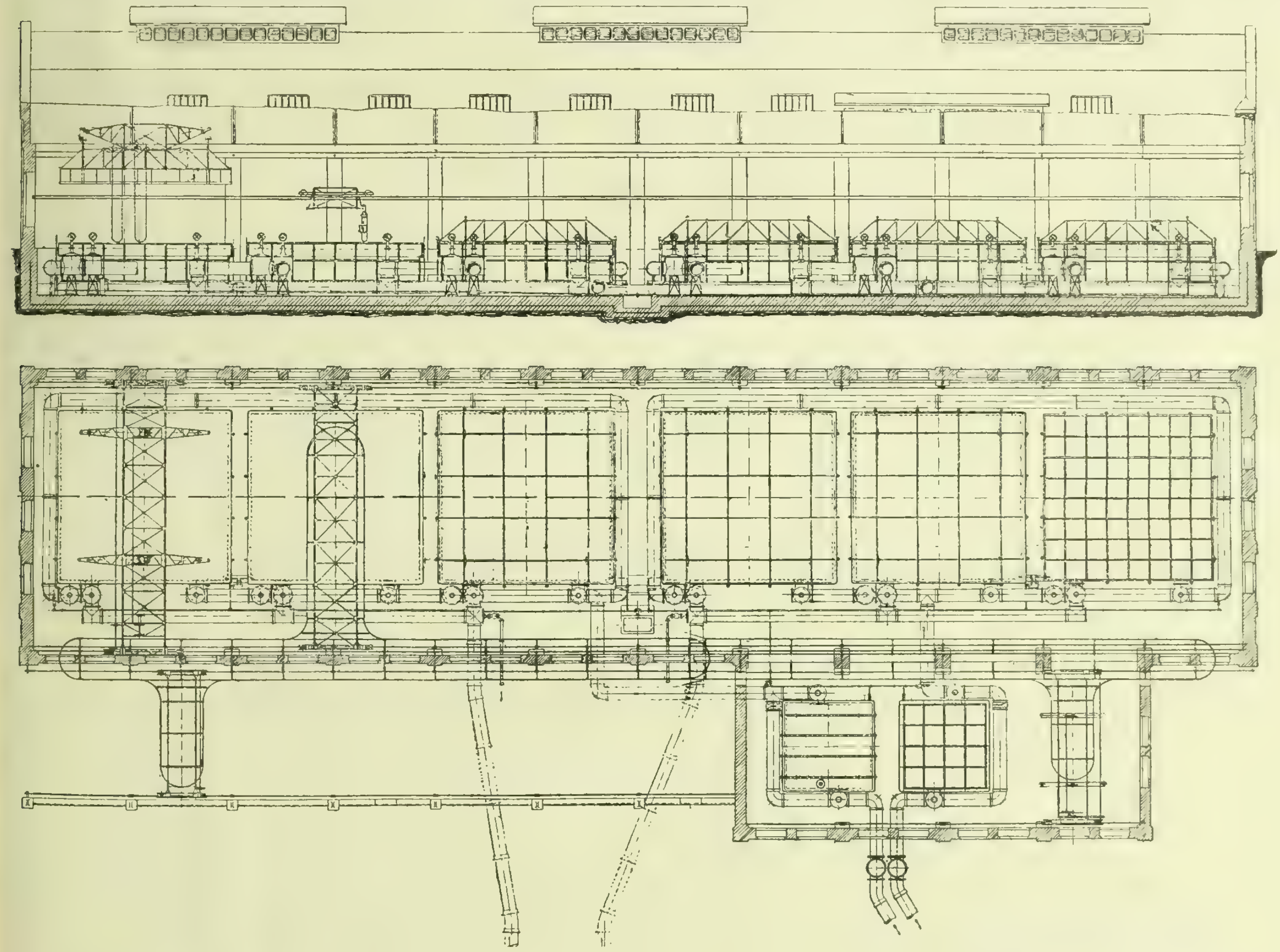
Ammonia Recovery.

novelty in gas-works' practice has been introduced at the buda works, where the Koppers direct ammonia recovery rocess, which has been employed for some years at coke-ovens, as been adopted. It had been ascertained by careful investigaons at Waldenburg, in Silesia, and elsewhere that the gas did not uffer in quality by its passage through the bath of acid.

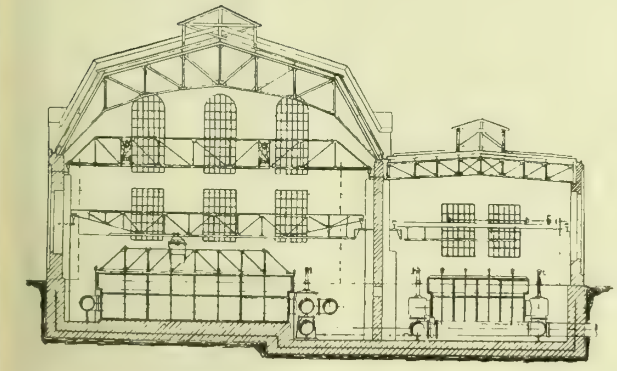
In accordance with the scheme of construction for the time eing, two complete sets of condensing, purifying, and other pparatus have been provided—each set having a capacity of ,766,000 cubic feet per diem. Additional apparatus has been rovided as a stand-by in case of need; and all the buildings have een made of such a size that another set of apparatus can be rected in them, and the capacity of the plant be thereby raised o about 14,100,000 cubic feet per diem. The apparatus comrises, in the order named, initial condensers (placed in the open ear the carbonizing ovens), secondary condensers, exhausters, ar-extractors, naphthalene washers, heaters, automatic saturaors, and final condensers.

The gas is drawn from the carbonizing chambers by two turboxhausters, each driven by a steam turbine. A third exhauster is rovided as a stand-by. Between the carbonizing chambers and the exhausters are four condensers, arranged in two sets, each with 36-inch connections, and having a total surface in contact with the cooling water of 15,825 square feet. For controlling the pressure in the hydraulic mains, automatic governors are placed at the inlet to each set of condensers. The condensers are followed by three tar extractors of the impact type, each having four bells and a movable tar-level. Then follow two naphthalene washers of the ordinary rotatory type, each of 4,766,000 cubic feet per diem capacity, driven by steam-engines directly coupled to them. These washers are arranged so that cyanogen washers can be attached to them later.

The speed of the turbo-exhausters is controlled by throttling the flow of steam. With the maximum of 4000 revolutions of the turbines per minute, nearly 320,000 cubic feet of gas are pumped per hour. At the normal rate of 2400 to 2700 revolutions per minute, the turbines pump 175,000 to 265,000 cubic feet of gas per hour. With a normal delivery of 247,000 cubic feet per hour—the number of revolutions being 2600 per minute—the consumption of steam is about 9 lbs. (at 8 atmospheres and 356° Fahr.) per 1000 cubic feet of gas pumped. The exhaust steam escapes at a pressure of 0·4 atmospheres above normal, and is utilized for heating liquor stills, warming the gas before it enters the saturators, &c. When the volume of gas pumped is lowered, the consumption of steam is relatively higher. With 36-inch connections and 247,000 cubic feet of gas pumped per hour, the rate of flow of the gas in the mains is 10·2 feet per second.



SIDE ELEVATION AND PLAN OF THE NEW PURIFIER HOUSE AT BUDAPEST.



Cross Section of the New Purifier House.

The gas from which the tar and naphthalene have thus been extracted enters the ammonia recovery plant. This consists of a lead-lined cylindrical vessel, with a funnel-shaped base and a cover. The gas enters through two lateral sockets and flows out of slits in a distributing ring. The outlet sockets for the gas are at the side of the cover, through the middle of which passes the steam and air ejector for removing the salt. Before the gas enters the saturator it passes through a heater, which raises its temperature to 68° to 77° Fahr. Though heat is liberated by the reaction between the ammonia and the sulphuric acid in the bath, constant dilution of the acid and sulphate solution would take place if the gas were not warmed, and the salt would not be recovered in the solid state. The heat of reaction also rarely suffices to evaporate from the centrifugal machines the little water which enters the saturators.

The gas passing through the slits in the distributing ring streams through the acid solution in quite fine jets, which afford very intimate contact with the solution. The ammonia in the gas combines with the excess acid to form the sulphate; and as the solution is kept saturated, the latter salt separates in the solid state, collects in the conical base, and is ejected from it through a spray remover into the salt pan. Solution carried up with the salt runs back from a syphon pot into the saturator. Fresh acid is added to the pot to maintain the solution in the saturator constantly of about the same degree of acidity. When sufficient salt has collected in the pan, the working of the ejector is interrupted, and the moist salt is discharged into the centrifugal dryer. The solution separated in the latter flows into the syphon pot, and thence into the saturator.

The gas, on its leaving the saturator, passes through an acid-extractor and then through the final condensers, which cool it to the ordinary temperature. The ammonia recovery plant is in three sets (one to serve as a stand-by), each to deal with 4,766,000 cubic feet per diem. The final condensers extract tar and the water liberated from the coal on carbonization. This water holds in solution the fixed ammonia—chiefly the chloride. The condensed water and tar run into a separating tank, from which the water is sent into the liquor well.

The liquor is pumped into an overhead tank, whence it runs to the distilling column, it which it is treated in the usual way with milk of lime. The greater part of the water is condensed from the escaping steam and ammonia, and is returned to the still. The ammonia vapours are passed into the gas before the inlet to the saturator, so that the ammonia from the condensed liquor is recovered therein at the same time. The great advantage of the direct-recovery process is that only a small quantity of liquor has to be distilled, and the cost of steam is consequently small. On the other hand, the whole of the ammonia is recovered as sulphate. The process works in a simple and trustworthy manner, and is cleanly, as it is carried out almost wholly mechanically.

PURIFICATION.

The gas issuing from the final condensers is passed through the purifiers, which have been arranged in two sets, each capable of dealing with 5,120,000 cubic feet per diem. A third set of the same capacity will be added when extension of the works is required. Since the cost of construction of purifiers is greatly reduced by making them as deep as possible, and since great depth is not detrimental to their proper working, it was decided to adopt a depth of 9 ft. 10 in. for the vessels, and an area of 39 ft. 4 in. square. There are three such vessels in a set. The dimensions are based on the assumption that there should be at least 4 cubic feet of purifying material per 1000 cubic feet of gas per diem, and that the rate of flow of the gas through the vessels should be about 1 cubic foot per minute.

In order to reduce the cost of handling the material, the frequency of revivifications was curtailed by the plan of reversing the order of working of the vessels every day. This plan necessitated the employment of a catch or check purifier, which was provided of the same depth as the principal purifiers, but only half their length and width. In order that the rate of flow of the gas through it should be the same, the stream of entering gas was split into two twice. On consideration of the relative advantages of water and dry seals, it was decided to adopt water seals, chiefly on account of their greater trustworthiness for vessels of such large size. It was also decided to put the purifiers under cover—the great depth and small area of the vessels rendering the cost of a house for them comparatively low.

Both the large and the catch vessels have the bottom and sides constructed of plates $\frac{3}{8}$ inch thick and 59 inches wide. The sides consist of two rows of these plates—the lower side plates and the upper cup plates. The 40-inch deep seal necessitated special strengthening of the cup plates, which, moreover, carried, cast on to them, the brackets for the floor framing. In order to facilitate the dropping of the purifier lid into the cup, there is a special guide fillet on each cup plate, curving away at the top. Thus the bottom edge of the lid is guided throughout its length into the cup, and holding-up of the lid on the top of the cup is avoided. The opposite sides of the vessels were originally joined by wire ropes, coated with jute, and having couplings which could be readily opened to allow of the ropes being cleared out of the way when the vessel was being discharged. But a year's trial has shown this arrangement to be unsatisfactory, and another [not described] has been substituted for it.

The grids are supported at the sides of the vessel on cast-iron brackets, and in the middle on T-iron bearers carried by 18 cast-iron columns. The grids are arranged in four tiers, or horizontal rows. Each row consists of one ordinary grid 2 inches deep, and two loosening (anti-caking) grids on the Pintsch system. All the grids are creosoted, and take a 20-inch layer of purifying material. Thus each large vessel contains about 360 cubic yards of it, and each catch vessel about 90 cubic yards. The bottom of each vessel is shaped in the concrete so that any condensed matter flows to a syphon. The gas enters through 36-inch connections, and is broken-up by channel plates into two or four streams.

The purifier lids are constructed with lattice girders and transverse stays on top, and are held down to the vessels at 16 points. There are two air valves, 20 inches in bore, on each lid. The lid is lifted from four points by cranes, of which there are four. The largest of these is designed for a load of 23 tons, has a span of 62 ft. 4 in., and is worked by hand chains. The lifting ropes for each opposite pair of points of suspension wind on the same drum, and the two drums are keyed on the same shaft, so that the lid is raised perfectly horizontally. There is an automatic brake on the lifting gear. The crane has a lattice framing. The smaller crane is designed for a load of 6 tons, and has a span of about 36 feet. This crane carries also the rail of an overhead line which is used for transporting the purifying material in telpher waggons which can be raised and lowered. A separate travelling overhead line is provided over the large purifiers for the same purpose. This joins-up with the fixed telpher line by two switches.

The chief reason why the cranes over the large vessels were built separately was that the crane for lifting the lids had to be at a great height in order that the deep girders of the lids should be cleared when a lid was moved to one side, and the raising of the suspension line to this height would have interfered with its connection with the fixed telpher track. Further, the separation of the cranes rendered their manipulation easier. A similar overhead line, communicating by switches with the fixed track, was installed in the revivifying sheds.

The gas is conveyed throughout through 36-inch connections—partly cast, partly pipes welded by water gas. Slide-faced valves are used partially on the catch purifier connections; and angle or through-way valves, closing on a hardened lead ring, and with mercury sealed cups also, are solely used for the large vessels. All the valves are operated by winches and conical wheel gearing. Water condensed in the vessels and connections flows into a pit, from which it is removed by a duplex pump.

Provision has been made for moistening the material in the vessels by steam admitted at the inlet connection, and also for its partial revivification *in situ* by air forced by a blower into the inlet main.

The general arrangement of the purifiers is shown in the engravings, which give a longitudinal section of the house with the two sets of large purifiers, a plan of the latter together with the two catch vessels, and a transverse section of the house.

(*To be continued.*)

Suggested Extensions of the Hague Gas-Works.

Owing to the increased gas consumption—which is calculated to reach about 9,555,000 cubic feet per day in 1916—the Hague Municipality wish to increase the productive capacity of their gas-works. For the foundations, a sum of £4167 has been granted out of the budget of this year. The extensions are intended to be made on the new Trekvliet Gas-Works. After careful consideration of the various carbonizing systems in connection with the present position of gas-making practice, and the tenders of several constructional firms, the Municipality prefer the installation of a Dessau vertical retort plant, by the Stettin Chamotte Fabrik A.G., for the sum of £33,333. This is increased by the above-mentioned £4167 for foundations, and a further £13,750 for other purposes. As similar plants of this type are not made by the Dutch industry, it is unavoidable to have the greater part of the installation made by a German firm. This firm, however, agree to the condition that work to the value of at least £10,500 shall be given to Dutch industrial firms, and that as much as possible of the constructional work shall be done by Dutch labour.

* * *

Employment of Prisoners of War on German Gas-Works.—A communication from the Central Gas Publicity Bureau at Berlin to the "Journal für Gasbeleuchtung" of the 26th ult., after referring to the extensive employment of prisoners of war in agriculture and many branches of industry in Germany, says that recently they have been employed on several gas-works, apparently with satisfaction both to the management and to themselves. There are, it is stated, gas-works where more than a hundred prisoners are engaged, including fitters and smiths, as well as unskilled men who have been taught some of the stokers' work in the retort-houses. The aptitude and diligence of the Frenchmen are specially commended; but favourable reports also are received of the Russians. Certain formalities have to be fulfilled, and obligations undertaken by works desiring to have prisoners of war assigned to them; and the Publicity Bureau offers to give inquirers information on these points.

Supply of Chemical Glass Apparatus.—During the past year, four meetings of the Education and Technical Education Joint Committee of the British Science Guild have been held to consider the best means of overcoming the difficulty which was being experienced in educational institutions in this country, through the cutting-off of the usual supplies of glass and porcelain apparatus from Germany and Austria. A report was prepared, copies of which were sent to the Press, the principal educational institutions, the leading dealers in scientific apparatus, glass manufacturers, and the Secretary of the Business Committee of the Members of the House of Commons. The Committee have reason to believe that, as a result of their work, a considerable stimulus has been given to the movement for the establishment of the manufacture, in this country, of glass and porcelain apparatus for scientific purposes. The Committee also draw attention to the very valuable work done by the Glass Research Committee appointed by the Institute of Chemistry. This Committee has published eleven formulæ based on the results of about 400 experiments; and these formulæ are now available for English manufacturers.

POWER PRODUCTION.

The "£ s. d." of the Question.

By H. C. Widlake, M.J.Inst.E., of the Plymouth and Stonehouse Gas Light and Coke Company.

No factor exercises a more continuous directive influence in the matter of improvement in power plant design and efficiency than does the competitive element in trade, and no factors are involved more closely with the cost of the finished product than are the power costs in a factory where any particular article has to be manufactured.

Any movement that conduces to lower power costs is inevitably bound to reduce the price of what we may term the objective of the plant—namely, the finished article; while, conversely, the manufacture of that article by old and uneconomical plant is necessarily bound to keep up its selling price. The scrapping of old plant in good condition cannot, in view of the heavy capital expenditure involved, be always regarded in the light of a sound financial policy. Hence economic changes are slow in taking place, and are often deferred till an existing power plant reaches the scrap-heap stage.

From the data given in the 1907 Census of Production, we learn that the total horse power of all types of prime movers in the United Kingdom amounted to 10,578,475. This figure represents the horse power which the engines were built to develop, or, in those cases where the engines were indicated, the indicated horse power at full load. Splitting these figures up among the different types of prime movers, we arrive at the following analysis:—

	Horse Power.	
	Total.	Per Cent.
Reciprocating steam-engines	9,118,818	86·2
Steam turbines	530,892	5·1
Internal combustion engines (gas and oil)	680,177	6·4
Water power	177,907	1·7
Other power	70,681	0·6
Total	10,578,475	100·0

The figures relating to a similar census for the year 1912 are unfortunately not at the writer's disposal; but there is no doubt that these figures would strikingly bring home to a student of power production the advance of the steam-turbine, the decline of the reciprocator, and last, but not least, the growing popularity of the internal combustion engine.

Of this total of 10,578,475 H.P., about 25 per cent. was used for the production of electric light and energy and 75 per cent. for driving machinery direct. Of the electricity generated, about two-thirds was produced in electric light and power stations, and the remaining third by sundry users; the largest output being the iron and steel trades, which generated rather less than a quarter of the total. The large extent to which, during the last eight years, private generating plants have been laid down and factories and collieries electrified would, in the later census, be responsible for a marked difference in the figures relating to the production of electrical energy. In the 1907 census no differentiation is made between gas and oil engines, and we learn that the total horse power of internal combustion engines in the United Kingdom was at that time 680,177, or 6·8 per cent. of the total power developed.

During the eight years that have elapsed since these figures represented the actual extent to which internal combustion engines were used, enormous strides have been made and a considerable amount of experience accumulated in connection with this particular type of prime mover, and a later census would undoubtedly show an enormous increase in the use of the internal combustion engine in all trades.

The use of steam for small independent units is rapidly decreasing—particularly in those districts where a public supply of gas or electricity is available; and from an economic point of view the gradual disappearance of these small steam "eaters" is particularly gratifying. Their replacement by gas-engines or electric motors is most marked, even in those industries where a supply of steam is necessary for some manufacturing process.

In a later portion of this article, the author proposes to deal with the question of large high-power gas-engines and their possibilities; but it is his main object to show how electrical competition can be met in regard to the comparatively low-powered engines used in small factories and run on town gas. It is an unpleasant, though equally true, fact that we have ourselves to thank for the undeniable pull the electrical people have over us in this respect. We have absolutely played into the hands of our electrical opponents by indulging in the foolish policy of underrating a powerful enemy which, to the uninitiated, certainly has many superficial points of recommendation. In every phase of life, private and commercial, this policy is a disastrous one, and in no stage of power competition has its folly been more strikingly apparent than in the fight between the gas-engine and the electric motor.

Most members of the gas industry have always allowed the electric motor to be (to them) a sealed mystery, and, confident in the known economy of the gas-engine to retain for it a "place in the Sun," have looked with lofty disdain upon a machine whose applicability for certain purposes cannot be denied by any intelligent person. The very fact that the principles of electrical phenomena are even now obscure has brought on the electric motor great abuse from advocates of prime movers whose actions are governed by old-fashioned and well-understood laws.

If electrical competition is to be intelligently met and handled, the gas engineer must be in a position to enable him to grasp the economic and technical possibilities of the electric motor, and to equate these possibilities to terms which will appeal to business men. One thing is certain, electrical competition will be no less severe in the future than it has been in the past; and there is every reason why the industry should go steadily ahead with an intelligent form of campaign for the popularizing of the use of gas for power purposes. Such a campaign calls for technical ability and persistent effort if it is to be attended with any degree of success; and in this article it is the author's hope to lay before those engineers who have to meet electrical competition facts which will enable them to combat in a clear, decisive, technical manner the claims (many fanciful) which are being put forward in support of the electric motor.

The engineer who desires to increase his engine consumption should not only be *au fait* with all the facts and figures pertaining to gas-engines, but should have at his finger ends all data concerning the machines against whose inroads he is fighting. Nothing has done the electric motor more harm in the eyes of business men than the absurd claims made on its behalf, on economical grounds, by small wiring contractors whose knowledge of the fundamental electrical units is about on a par with their estimation of the intelligence of their clients. The claims made by these people in connection with the particular type of motor for which they happen to be agents are often preposterous, and result in an accumulation of dissatisfied consumers for which, it must in fairness be observed, the electrical supply authorities are in no way responsible. The average prospective power consumer is usually a keen business man, who will plump for the power which is proved to him to be the most economical, having due regard to the conditions of his own particular business. Neither the gas nor the electricity advocates will do their cause any good by indulging in hysterical statements regarding the rival machine.

Running Costs.

The first question of every prospective power user is "what will it cost to run;" and if he is to be secured as a consumer, it must be by the statement of hard facts based on the commercial units of pounds, shillings, and pence. He will not appreciate being talked at in horse-powers, efficiencies, &c., neither will his enthusiasm be aroused by long-winded statements regarding amperes and volts. The only basis he can afford to recognize if he intends to run his plant on economical lines is the commercial one of *£ s. d.;* and it is to this that all the technical factors bearing on the case must be equated and submitted in this simple form for his consideration. He should be careful not to be influenced by seductive data, *re* low running costs of electric motors in towns other than that in which he carries on his business—towns in which local conditions, such as close proximity to the coalfields, permit of electrical energy being retailed at a comparatively low figure.

The power consumer may be broadly divided into three classes. In the first case, there is the small tradesman who has no apparatus or machinery that cannot be operated by hand, but who, for the sake of general convenience and the saving of time and labour, desires to put in a power motor of some description. There are several manufacturers of very small and excellent gas-engines who cater especially for this class of consumer, in connection with whom the importance of being first in the field cannot really be exaggerated. If he has been persuaded to put down an electric motor, the case is practically hopeless. His load factor is bound to be a very poor one; and unless the economic difference between gas and electricity in his district is abnormal, he cannot be conscientiously advised to throw out the electric motor in favour of a gas-engine, in view of the length of time that must elapse before —owing to the capital expenditure in making the change—the economy of the gas-engine would become manifest.

Secondly, there is the proprietor of a business whose nature renders the use of a power motor an absolute necessity, but whose limitations do not warrant the use of more than (say) two engines. It is this class of consumer who on most undertakings is responsible for the largest proportion of the power consumption. His load factor is usually a good one, and enables the gas-engine to make a good show against its rival.

Lastly, there is the large factory proprietor, whose requirements are best met by either group or individual driving by electric motors supplied from a private gas-driven generating station, and with whose needs it is proposed to deal later.

Stock Arguments for Electric Motors.

In the formidable list which will shortly be given of stock arguments advanced in favour of their wares by electric motor manufacturers, it will be noticed that all mention of the greatest factor of all—namely, running costs—is carefully omitted. An electric motor admittedly possesses certain technical advantages not only over gas-engines, but over most other types of prime movers. It is equally true, however, that, where a small user of (say) two or three power motors is concerned, these advantages have no commercial value. In their purely technical form they must naturally appeal to true engineers; but they cannot so appeal to business men unless they are associated with low running costs, which they are decidedly not.

In the last few years thousands of electric motors have been installed in many parts of the country; but this fact cannot be regarded as any testimony to their economy in spite of the extent to which it is used as an argument to push the sale of the electric motor. What it really does constitute is a proof of the credulity with which the non-technical man is ready to accept statements regarding vague compensating advantages which do not in any way conduce to lower running costs, and to instal a machine without the remotest idea of what these costs are likely to be.

The gas engineer who has to meet electrical power competition should first of all ascertain the exact cost of running both gas-engines and electric motors on the basis of the respective rates for gas and electricity pertaining in his particular district. The time has passed when the interests of either type of prime mover can be served by wild statements regarding high running costs. The efficiencies of both gas-engines and of electric motors are now, in all good makes, practically standardized, and the whole matter can be placed on a perfectly sound arithmetical basis. To effectively meet electrical competition the gas engineer should be in a position to reply to the many seriously misleading statements that have been, and are being, made by parties interested in the electric motors with a view to creating in the minds of the manufacturing public a grave prejudice against the internal combustion engine. Any stick is good enough to beat a dog with; and a perusal of some of the electrical publications would give one the impression that any argument is good enough to direct against a gas-engine.

The following are the usual arguments with which the electrical enthusiast positively bristles when a gas-engine is mentioned.

(*a*) The initial cost of a gas-engine is higher than that of an electric motor, as are also
(*b*) Its lubrication costs, and
(*c*) The cost of installing same.
(*d*) It is a matter of labour and difficulty to start a gas-engine, whereas in the largest size electric motor starting is an extremely simple matter.
(*e*) The gas-engine is not a clean type of prime mover.
(*f*) A gas-engine requires constant attention, whereas attendance charges in connection with an electric motor are practically *nil*.
(*g*) A gas-engine is less reliable than an electric motor, and renewals are frequent and costly.
(*h*) A gas-engine takes up a relatively larger amount of space than does an electric motor of equal power.
(*i*) The efficiency of a gas-engine decreases largely with age, while it is wasteful at light loads.
(*j*) The overload capacity of an electric motor is very high, while that of a gas-engine is limited.

These are the usual stock arguments; and the writer proposes to deal with them, as far as possible, separately, and to indicate the general lines upon which they should be met and combated.

(*a*) The initial cost of a gas-engine is higher than that of an electric motor, as are also
(*b*) Its lubrication costs, and
(*c*) The cost of installing the same.

These are obviously factors that can only be taken into really serious consideration when reviewing the whole question of running costs. A perfectly definite relationship exists between the economic possibilities of gas at so much per 1000 cubic feet and electricity at so much per unit; and this relationship is clearly shown in Tables I., II., and III., which will be found to contain much definite information regarding factors concerning which the wildest statements have been made from time to time. It may be observed that the efficiencies allotted to electric motors have been carefully selected with a view to placing the motor on the fairest possible basis. They are practically test-bed efficiencies, and it is unlikely that under actual working conditions such favourable figures could be obtained.

TABLE I.—*Yearly Working Costs of Gas-Engines.*

Basis: (1) Horizontal single cylinder gas-engines working on town gas having a calorific value of 500 B.Th.U. (2) 2800 working hours per year at normal load. (3) Price of gas 1s. 4d. per 1000 cubic feet.

Normal load B.H.P.	1½	2½	3½	5	8	10½	16	22	30	38	47
Efficiency—cubic feet per B.H.P. per hour	35·8	30	29·2	26·9	25·2	23·6	21·6	20·7	20·3	20·3	19·8
Consumption of gas per annum, cubic feet	151,000	210,000	287,000	377,000	565,000	694,000	968,000	1,276,000	1,706,000	2,160,000	2,606,000
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Cost of engine, tanks, &c., fixed complete	33 0 0	41 0 0	52 10 0	61 0 0	84 10 0	93 0 0	124 0 0	146 0 0	167 0 0	207 0 0	237 0 0
Gas consumed per 2800 hours	10 1 4	14 0 0	19 2 8	25 2 8	37 13 4	46 5 4	64 10 8	85 1 4	113 14 8	144 0 0	173 14 8
Interest on capital expenditure at 5 per cent.	1 13 0	2 1 0	2 12 6	3 1 0	4 4 6	4 13 0	6 4 0	7 6 0	8 7 0	10 7 0	11 17
Depreciation at 5 per cent.	1 13 0	2 1 0	2 12 6	3 1 0	4 4 6	4 13 0	6 4 0	7 6 0	8 7 0	10 7 0	11 17
Lub. oil at 1s. 6d. per gallon	0 11 10	0 19 8½	1 7 7	1 19 4½	2 14 7	3 11 8	4 4 0	5 15 6	6 6 0	7 19 6	9 17 0
Total working cost per year	13 19 2	19 1 8½	25 15 3	33 4 0½	48 16 11	59 3 0	81 2 8	105 8 10	136 14 8	172 13 6	207 6 2
Actual working cost per hour	1·2d.	1·6d.	2·2d.	2·8d.	4·2d.	5·1d.	6·9d.	9d.	11·7d.	14·8d.	17·8d.

NOTE.—Should the cost for gas consumed by existing engines be more or less than that shown above, it simply means that the actual mean load is more or less than the assumed mean load on which the above calculations are based.

The item "cost of engine tanks, &c., fixed complete" in the above table has been derived from the list of a well-known firm of British manufacturers.

TABLE II.—*Yearly Working Costs of Electric Motors.*

Basis: (1) Single phase squirrel cage motors running at 950 revolutions per minute. (2) 2800 working hours per year at normal load. (3) Price for current, 1½d. per Board of Trade unit.

Normal load B.H.P.	1½	2½	3½	5	8	10½	16	22	30	38	47
Efficiency of motor, per cent.	75	77	77	80	82	82	84·5	86	87	87·5	88
Consumption of electrical energy per annum (B.T.U.)	4177	6782	9495	13,055	20,379	26,747	39,551	53,434	72,027	90,713	111,561
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Cost of motor and switchgear, fixed complete	22 2 6	25 10 0	29 19 0	34 7 6	40 0 0	53 0 0	66 0 0	82 0 0	102 0 0	114 0 0	128 0 0
Current used per 2800 hours at 1½d. per unit	26 2 2	42 7 9	59 6 10	81 11 10	127 7 4	167 3 4	247 3 11	333 19 3	450 3 5	566 19 2	697 5 1
Interest on capital expenditure at 5 per cent.	1 2 1½	1 5 6	1 10 0	1 14 4½	2 0 0	2 13 0	3 6 0	4 2 0	5 2 0	5 14 0	6 8 0
Depreciation at 5 per cent.	1 2 1½	1 5 6	1 10 0	1 14 4½	2 0 0	2 13 0	3 6 0	4 2 0	5 2 0	5 14 0	6 8 0
Lub. oil at 1s. 6d. per gallon	0 5 7½	0 7 6	0 7 6	0 7 6	0 9 4½	0 9 4½	0 11 3	0 11 3	0 13 1½	0 15 0	0 18 9
Total working costs per year	28 12 0½	45 6 3	62 14 4	85 8 1	131 16 8½	172 18 8½	254 7 2	342 14 6	461 0 6½	579 2 2	710 19 10
Actual working cost per hour	2·4d.	3·8d.	5·4d.	7·3d.	11·3d.	1s. 2·8d.	1s. 9·8d.	2s. 5·4d.	3s. 3·6d.	4s. 1·6d.	5s. 1d.

NOTE.—Should the cost for electrical energy consumed by existing motors be more or less than that shown above, it simply means that the actual mean load is more or less than the assumed mean load on which the above figures are based.

The item "cost of motor and switchgear, fixed complete" in the above table has been derived from the lists of a well-known firm of British manufacturers.

The above figures are equally applicable to direct current and multiphase alternating current motors, the efficiencies and hence the current consumption of which are practically the same as those quoted in the above table.

TABLE III.—*Summary of Tables I. and II.*

Brake Horse Power.	Actual Working Costs.				Saving Effected by Using Gas-Engines.	
	Gas-Engines.		Electric Motors.			
	Per Year.	Per Hour.	Per Year.	Per Hour.	Per Year.	Per Hour.
	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.
1½	13 19 2	1·2	28 12 0½	2·4	14 12 10½	1·2
2½	19 1 8½	1·6	45 6 3	3·8	26 4 6½	2·2
3½	25 15 3	2·2	62 14 4	5·4	36 19 1	3·2
5	33 4 0½	2·8	85 8 1	7·3	52 4 0½	4·5
8	48 16 11	4·2	131 16 8½	11·3	82 19 9½	7·1
10½	59 3 0	5·1	172 18 8½	1 2 8	113 15 8½	9·7
16	81 2 8	6·9	254 7 2	1 9·8	173 4 6	1 2·9
22	105 8 10	9	342 14 6	2 5·4	237 5 8	1 8·4
30	136 14 8	11·7	461 0 6½	3 3·6	324 5 10½	2 3·9
38	172 13 6	1 2 8	579 2 2	4 1·6	406 8 8	2 10·8
47	207 6 2	1 5·8	710 19 10	5 1	503 13 8	3 7·2

NOTE.—All figures given in the preceding tables are based on the brake (or effective) horse power developed on the respective driving pulleys of the motors and gas-engines. They do not take into account the losses incurred in transmission, which, in the case of a motor drive, are excessive on account of the initial high speed of the motor and the consequent loss in the slipping of belts running at high speeds over pulleys of small diameter.

THE CONSUMPTION OF ELECTRIC MOTORS.

Any technical explanation of electrical phenomena is quite outside the scope of this article, and it is merely intended to place such information before the reader as will enable him to deal competitively against the claims of the electric motor. Broadly speaking, electric motors belong to two classes—alternating current and continuous current. Each class may be further subdivided into other classes, according to the character of the supply and the particular duty which the motor may have to perform. In this connection, it may be pointed out that, unlike a gas-engine, an electric motor is, from a commercial point of view, a very dangerous apparatus to buy second-hand without expert guidance. The pressures, phase, and character of electrical supply systems vary so much in different towns that a motor picked up "cheap" may prove utterly unsuitable for operating on the supply mains in the unfortunate buyer's district.

The manufacture of the electric motor has been placed on a perfectly sound basis. The efficiency of all modern motors is furnished to the buyer by the makers; and the prospective user, provided he knows the amount of power he requires, is in a position to know what his running costs are going to be before he places the order for the machine. The efficiency of motors is expressed as a percentage existing between the actual current delivered and metered at the motor terminals and the amount of power that may be available for actual work at the driving pulley.

As has already been shown, the efficiency varies directly with the speed of the machine; and with motors of given speed and power it varies with the character, phase, and periodicity of the supply. The author, however, does not propose to deal with any hairsplitting factors in this connection, and the efficiencies allotted to the different motors in the table of running costs are liberal figures, and may be taken as fair for any of the ordinary types of commercial motors.

For the purpose of illustrating the manner in which the consumption of an electric motor is arrived at, we will select the 16 B.H.P. motor from Table II.

One horse power is the equivalent of 746 watts, from which we find that the output of this machine is:

$$746 \times 16 = 11{,}936 \text{ watts.}$$

The input, however, is considerably more, owing to the internal losses in the machine; and upon reference to Table II. we observe that in this particular case these losses amount to 15·5 per cent. of the total power supplied—in other words, the efficiency of the machine is 84·5 per cent. Applying this figure to our calculated output, we find that at full load the input will be:

$$\frac{11{,}936 \times 100}{84{\cdot}5} = 14{,}125 \text{ watts.}$$

A Board of Trade unit equals 1000 watt-hours, from which we are able to calculate that the full load hourly consumption of this machine will be:

$$\frac{14{,}125}{1000} = 14{\cdot}125 \text{ B.T.U.}$$

It will be observed that these figures are based on the assumption that the engine is running at or near its normal full load. The amount of heat units supplied to a gas-engine may be analyzed into two parts. One part is expended in overcoming the inertia of the moving parts of the engine, and the friction associated with the same; the other portion is converted into mechanical energy, and is available for transmission at the engine pulley. It may be assumed for all practical purposes that this frictional loss remains the same at all loads; and bearing this in mind, the efficiency of any engine may be calculated at any load factor.

Let us take, for instance, the case of a 100 B.H.P. engine having a full load efficiency of 9000 B.Th.U. per B.H.P. hour, and an efficiency of 85 per cent. The I.H.P. at full load would be $\frac{100 \times 100}{85}$ = (say) 118 H.P., of which 18 would be absorbed by the frictional and inertia losses in the engine, leaving an actual or effective horse power of 100 for use at the engine-shaft. At this load the consumption per I.H.P. would be:

$$\frac{9000 \times 100}{118} = 7650 \text{ B.Th.U.}$$

At a load factor of 75 per cent. the actual horse power developed by this engine would be 75 + 18 = 93 I.H.P., while the consumption would be:

$$\frac{7650 \times 93}{75} = 9500 \text{ B.Th.U.}$$

The following table gives the full, three-quarter, and half load guaranteed consumptions of the engines by a firm of leading gas-engine manufacturers, based on town gas having a net heating value of 500 B.Th.U. per cubic foot.

TABLE IV.

Normal B.H.P.	Consumption per B.H.P. Hour. Load Factor per Cent.		
	100	75	50
1·25	34·1	37·6	41
3·5	27·8	30·6	33 4
4·0	25·1	27·6	32·4
6·5	23·9	26·3	30·6
8·0	23·9	26 3	30·6
10·0	22·0	24·1	28·2
11·5	20·9	23 1	26·6
17·0	20·6	22·7	26·4
20·2	20·4	22·4	25·9
25·6	19·5	21·8	24·5
31·5	19·5	21·8	24·5
39·0	19·2	21·1	23 8

The lubrication of internal combustion engines is a matter of vital importance; and while excessive attention to this matter is conducive to higher running costs than would otherwise be involved, it must not be forgotten that the oil used on the cylinders and pistons can be filtered and used and debited to other portions of the plant for which it will still be suitable.

The following table will give an idea of the oil consumption which practical experience shows may be accomplished:

TABLE V.

B.H.P.	Speed.	Oil-Pints per B.H.P. Hour.
1·5	550	0·015
2·5	350	0·015
3·5	310	0·015
5·0	300	0·015
8·0	280	0·013
10·5	280	0·013
16·0	250	0·01
22·0	250	0·01
30·0	250	0·008
38·0	240	0·008
47·0	230	0·008

(*To be continued.*)

Prizes for the Gas-Fitting Examinations.

The Council of the Society of British Gas Industries have extended encouragement to gas-fitters in the matter of technically equipping themselves in a manner qualifying for candidature in the examinations in "Gas-Fitting." In a communication on the subject from the Secretary of the Society (Mr. Arthur L. Griffith), he says: "The Council have decided to give the following prizes annually on the result of the City and Guilds of London Institute Examinations in 'Gas-Fitting' (honours grade), in addition to the prizes already given in 'Gas Engineering' and 'Gas Supply': First Prize, three guineas; Second Prize, two guineas." Hearty congratulations to the Council upon their interest and practical encouragement.

Chemical Society's Plan to Help.—In pursuance of the desire of the fellows to assist the Government, the Council of the Chemical Society intimate that they have constituted themselves a consultative body, who will meet at frequent intervals to consider, organize, and utilize all suggestions and inventions which may be communicated to them, and will report on them to the proper authorities. Accordingly, the President and Council invite the fellows of their own and kindred societies to forward to them, at Burlington House, W., in strict confidence, suggestions and inventions for consideration.

Fire Danger from Slaked Lime.—In the Royal Saxon Mechanical-Technical Experiment Station, experiments have been carried out which prove that it is easily possible for wood to catch fire from slaking even the poorer qualities of lime. Naturally, the temperature reached depends, besides on other factors, on the quality of the lime. Even limes poor in calcium oxide may produce a temperature of 270° to 300° C., at which point wood is charred on exposure to the air. Lime of poor quality then must be considered to a certain extent dangerous, and high-grade lime must be handled with special care, since it can produce temperatures of 400° and over. It must never be stored in contact with wood.

REINFORCED CONCRETE AT CLECKHEATON.

When briefly describing in the "Journal" earlier this year the new gas-works at Moorend of the Cleckheaton Urban District Council, which include a Woodall-Duckham vertical installation, mention was made of the reinforced concrete work, which includes the foundations of the retort-house, an underground tar and liquor tank, a small water-tank, and three substructures supporting a truck weighbridge and two coal-hoppers. Regarding this, there may now be added the following particulars, which have been taken from the current number of "Concrete and Constructional Engineering."

It was decided to have a raft foundation to the retort-house, in order to reduce the pressure on the ground to a maximum of 1 ton per square foot. The siding was constructed by tipping 45,000 tons of material to a depth of 32 feet along the length of the site adjoining the Lancashire and Yorkshire Railway main line; and the substructures were carried from the solid ground to prevent sinking of the weighbridge and coal-hopper by subsidence of the tipped material.

The retort-house raft is about 85 feet long by 40 feet wide, with four longitudinal rows of columns at distances of 10 feet, 16 feet, and 10 feet centres, respectively. The columns in the two external rows are at 15 feet centres, the load on each column being 5 tons; and the columns in the two external rows are at 7 ft. 6 in. centres, the load on each column being 90 tons. The principle on which the raft was designed was reinforced concrete slabs spanning between longitudinal reinforced concrete beams under each row of columns. The beams and slabs were reinforced with Kahn trussed bars and rib bars.

The liquid residuals of the process of gas manufacture are collected in an underground reservoir, which is also constructed in reinforced concrete. The tank is a circular one, with an internal diameter of 40 feet, and holds a depth of 12 ft. 6 in. of liquid. Its capacity is 99,000 gallons. The bottom slab and sides of the tank are 7 inches thick; and the roof, which carries 4 feet of earth, is composed of a 5-inch slab spanning between beams which are carried on the outer wall of the tank and on two internal columns. The whole of the reinforcement consisted of Kahn trussed bars and rib bars.

A small underground water-tank, 13 ft. 6 in. long by 11 feet wide and 7 ft. 5 in. deep, and divided into two compartments, was also constructed in reinforced concrete. The bottom slab and walls of the tank were 6 inches thick, the roof 5 inches thick. Kahn rib bars were used as reinforcement throughout.

Three substructures to an elevated weighbridge and two coal-hoppers are also constructed in reinforced concrete. They consist of a reinforced concrete platform slab, which is carried on four external beams supported on four corner columns about 24 feet long, with horizontal braces midway between the bases and the platform for the former, and similar columns for the latter. The column bases are in reinforced concrete, and are 4 feet square.

Other plant and buildings erected on the new works are boiler, pump, exhauster, washing plant, meter and governor houses, purifiers, condensers, and overhead tanks. The works have been laid out on an ornamental scale, and have cost £42,000.

The whole of the works, excepting the retort-house, were designed by Mr. A. L. Jennings (the Manager), with Messrs. Thomas Newbigging and Son, of Manchester, as expert advisers.

The Proposed German Nitrate Monopoly.

According to the "Chemical Trade Journal," the deliberations have now been adjourned until next month (August) of the Commission of seven members of the German Imperial Parliament who were appointed to consider the Government Bill which proposes to authorize the Federal Council to create a commercial monopoly of nitrogenous combinations, and every disposition is being manifested in official circles to keep the proceedings secret. Indeed, the semi-official "Norddeutsche Allgemeine Zeitung" has stated that every reason exists for not informing the enemy of the practical measures which have hitherto been initiated for ensuring an adequate production of nitrogenous compounds during the war. The newspaper, proceeding to correct certain assertions which have been made, remarks that the idea that the monopoly proposed is solely based on the output of cyanamide is erroneous. On the contrary, the object is to secure a sufficient production of any kind of nitrogenous combinations in the country for all possibilities. The assumption is also incorrect that the Imperial authorities, in the measures already adopted, have left out of consideration the Haber process for the synthetic production of sulphate of ammonia, and have solely restricted themselves to the Caro process for the extraction of cyanamide. In reality the authorities, by the grant of far-reaching financial co-operation, stimulated the acceleration of the working and a considerable extension of the plant operating on the Haber system before the contracts with the cyanamide group were brought to a conclusion.

Mr. James Searle, formerly General Manager of the New River Company, who died April 14, aged sixty-seven, left £32,364.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Make of Gas in Vertical Retorts.

Sir,—As we have had several inquiries as to whether the make of gas is maintained on vertical retort-settings after the same have been working some time, we have pleasure in giving you particulars of the last four months' working of an intermittent vertical retort-setting which we erected five years ago, and in connection with which up to the present there have been no repairs done. The figures, which are supplied to us by the engineer, read as follows:

Coal carbonized	6,448 tons.
Gas made	94,227,900 cubic feet.
Gas made per ton	14,613 ,, ,,
Illuminating power (No. 2 burner) . .	14·40 candles.

We trust that this information will be interesting to your readers, as proving that the results to be obtained from a vertical retort installation are as satisfactory at the end of a lengthened period as when the plant was first put down and guaranteed results obtained.

Goodall, Clayton, and Co., Ltd.,
per C. A. Goodall, Managing-Director.

Leeds, July 10, 1915.

Ovoid Briquetting at the Nuremberg Gas-Works.

Sir,—We were much interested in the abstract appearing in the "Journal" for June 29, p. 755, on the above subject, which we venture to suggest is well worth the careful consideration of all gas managers in this country, and which, if properly followed up, can be made one of the most profitable parts of every leading gas-works.

Two items in the report are of special interest—viz.: (1) That the Nuremberg briquette plant has been in continuous work for three years; and (2) that these "Ovoid" briquettes, made from coke breeze agglomerated with pitch, are suitable either for firing purposes or for domestic use.

Fuel of all kinds, except coke breeze, is in great demand, fetching high prices which are likely to continue for some years. Pitch is now at a very low price, which is also likely to continue. Briquette machinery has been our speciality for nearly forty years, and with our improved plants small coke breeze (say, at 3s. per ton) suitably agglomerated with pitch, can be converted into "Ovoid" briquettes suitable either for firing boilers or for domestic use, at a cost of under 2s. 6d. per ton, which price includes pitch, steam, labour, grease, and 15 per cent. interest on capital for wear and tear and depreciation. The total cost of gas breeze "Ovoids" is (say) 5s. 6d. per ton. As these can well compete with boiler fuel at from 10s. to 12s. per ton, they should realize a handsome margin of profit on manufacture.

We are at present erecting an "Ovoid" briquette plant in Turkestan; and we have in hand orders for other "Ovoid" plants for Holland, Nottingham, France, and Russia.

Yeadon, Son, and Co.

Leeds, July 9, 1915.

Is the Institution of Gas Engineers a Failure?

In his monthly letter, entitled "Special English Correspondence," as given in the "American Gaslight Journal" of the 28th ult., Mr. Norton H. Humphrys, of Salisbury, wrote as follows:—

When a question of the character that heads this letter is propounded in the columns of the "Journal of Gas Lighting" and decisively answered in the affirmative, there is indication of a position that calls for serious consideration. For all practical purposes, the Institution has existed for over fifty years, as, although the title has been changed more than once, no broad alteration to the methods of procedure have been made. And over the whole of this period there has been in existence, both among the members and outside, a feeling that the Institution is not what it should be—a real, live, representation of the interests of gas engineers and managers, if not of the gas industry as a whole, strong enough and capable enough to deal effectively with matters concerning the general welfare, which would include the work now being done by several different organizations that have been forced into existence by the necessities of the times, and as such are active competitors for the position above indicated. I refer to the District Associations, the Junior Gas Associations, the British Commercial Gas Association, the Society of British Gas Industries, the Sulphate of Ammonia Committee, the London Coke Sales Committee—not to mention the public spirit exhibited by the London gas companies and other large undertakings. Some of these trench upon the extremely circumscribed area of mutual improvement which the Institution has always claimed as its own. A permanent indication of this feeling is the fact that the Institution, as evidenced by the list of members, has never at any time appealed to the sympathies of even 50 per cent. of the gas-works managers within its district. But apart from this, there are periodical eruptions, like the spots on the sun, which can usually be traced to some current exciting causes that serve to emphasize the need of a strong, united representation of the profession.

In the first place, the Council decided that the meeting this year should be only *pro formâ*, as, on account of the interrupted railway traffic, labour difficulties, &c., an adequate attendance was doubtful. This meeting, by the way, was held on the 1st inst., and, notwithstanding the bareness of the programme, there was a fair attendance. The other bodies instanced have held successful gatherings, notwithstanding similar disadvantages—the Southern District Association at Cambridge only a few days ago. It is to some extent a confession of weakness that at the present time, when so many new conditions are arising, the Council did not feel equal to the promotion of a larger programme. This limpness is not evident in the working of kindred professional institutions. A few weeks ago a coal conference was held in London, and attended by quite 500 members of the Institution at short notice, which was proof that, provided an adequate programme, there need be no fear of empty seats. The Institution, having no home of its own, was indebted on that occasion to the hospitality of a much younger branch of engineering—the Electricians—for the use of a commodious and elegant hall for the purpose of the congress. And this aroused an old sore. Why, it is asked, when other industries provide themselves with commodious premises for meetings and for the convenience of members, cannot the Institution of Gas Engineers meet under its own vine and fig tree? Lastly, the profession has been blown-upon by unjust treatment of certain members, by advertisements offering inadequate remuneration, and by undue interference of committeemen possessed of more confidence than competence.

The reasons given for the conclusion set forth at the commencement are that the Institution has in no way improved the position of its members, either from an educational, financial, or social point of view; that after fifty years of existence it has failed to provide a central building or meeting-place; and that it has failed to open its doors to the best brains of the associated industries. These points are emphasized by the work done by kindred professional Associations for the benefit of their members.

REGISTER OF PATENTS.

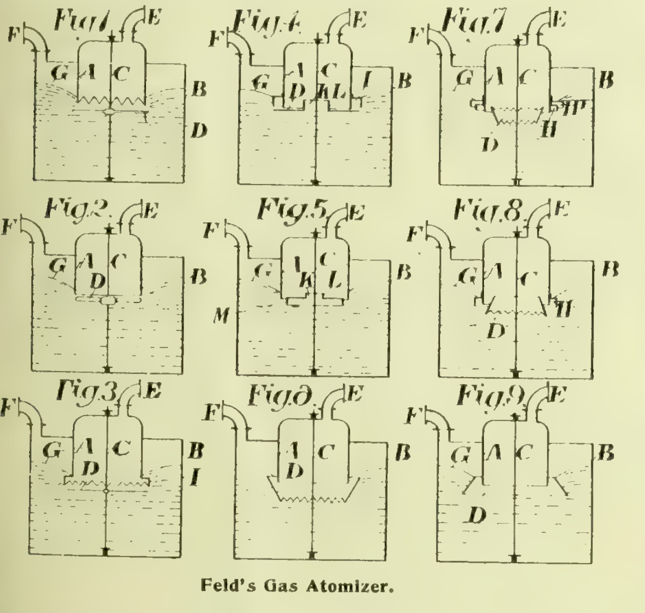
Bringing Liquids and Gases or Vapours into Contact with Each Other.

Markel, K. E.; a communication from Walther Feld G.m.b.H., of Linz-on-the-Rhine, Germany.

No. 14,240; June 12, 1914.

According to this invention, in combination with a stationary bell (or equivalent) there is used one or other of the following devices: A plain circular disc rotated under a stationary bell, or its equivalent, by a concentric shaft. Such arrangement, the patentee remarks, has the advantage that the required action is obtained with an expenditure of power considerably less than that hitherto required. When the disc rotates, the liquid is forced to the edge of the disc and the gas is drawn in from the bell up to the disc and atomized into the liquid. If the middle of the disc be provided with a concentric opening, gas from the bell above the disc is, in consequence of the centrifugal force, drawn in and pressed below the disc into the liquid and very finely atomized below the disc and at the edge of it, and the gas penetrates into the liquid to a lower level than the level to which the bell dips—that is to say, the pressure of the gas drawn into the liquid is increased by the rotation of the liquid, and the efficiency of the action is increased; less power being required for working the device forcing in the gas. If the gas inlet to the bell be closed, a vacuum is produced under the bell amounting, according to the velocity of the liquid, to (say) from 100 to 200 mm. of water.

If the central opening in the disc, or the outer edge of the disc (or both), be provided with a cylindrical or conoidal projecting rim, the atomization of the gas caused by the suction is still further increased. The device for imparting rotary movement to the liquid can be so made that it constantly brings liquid from the lowest part of the liquid-container to the upper surface, and thereby constantly brings fresh particles of liquid into contact with the gases, and by a combination of this device with the disc the desired action can be further considerably increased. A further increase of the desired action is obtained if the lower edge of the bell and the lower or upper edge (or both) of the rotating device be perforated or notched. Discs with perforations in them also increase the efficiency of the action.



Feld's Gas Atomizer.

The accompanying drawing illustrates, in vertical section, various forms of apparatus constructed according to the invention. In all the figures A indicates the stationary bell; B, the vessel containing the liquid; C, the vertical shaft on which is carried the rotating device D; E, the pipe for supplying gas to the bell; F, the gas outlet pipe; and G, the upper surface of the liquid.

Fig. 1 shows a rotating device with stirring arms D arranged diametrically opposite each other with the lower edge of the bell notched; while in fig. 2, the bell is not notched, but is solid—that is, not perforated or reticulated—throughout, and screw-propeller blades are shown in place of the plain arms. In fig. 3, the rotating device consists of a plain horizontal disc; and the bell A is provided, at its lower part, with an annular inverted trough or second concentric bell I, notched as shown. Fig. 4 shows a modification in which a second inverted trough or small bell is attached to the outer side of the bell A; and there is a central opening K in the disc which is provided with an upward flange L, for the purpose of increasing the suction effect. Fig. 5 shows such a disc provided on the outer periphery with a second flange M, by which the suction effect is further increased. In fig. 6 the device D consists of an inverted frustum of a cone with zig-zag notches at the lower end. In fig. 7, the bell is provided with two concentric inverted troughs or small bells H H^1, for the purpose of repeatedly atomizing in the liquid the gases or vapours which have collected under the bells. The device D is shown as being notched on both edges. In this arrangement, the inverted troughs or concentric bells dip into the liquid to the same or different depths; but it is generally preferred that the outward concentric inverted trough or bell shall dip to a less depth into the liquid than does the inward bell. In fig. 8, the rotating device consists of a frustum of a cone having notches at its lower edge, and with one additional inverted trough or small bell H. In fig. 9, the device D is a frustum of a cone which surrounds the exterior of the lower edge of the bell.

Automatically Lighting and Extinguishing Gas-Lamps.

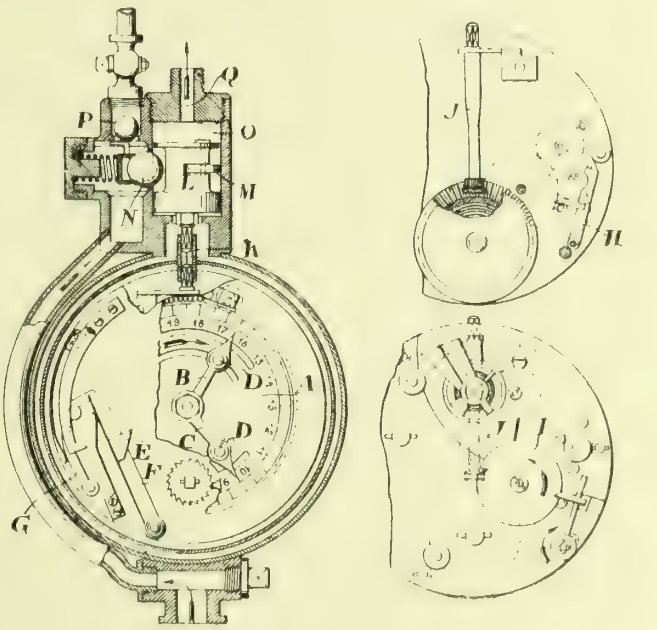
Meyer-Keller, O., of Lucerne, Switzerland.

No. 14,432; June 16, 1914.

This apparatus for automatically igniting and extinguishing gas-lamps at predetermined times is of the type wherein a rotary member, located in a valve casing, is connected to the axle of a driving mechanism, and has at least one lifting part for actuating the respective gas-valve and means for preventing the gas leaking into the casing containing the driving mechanism.

The object of the invention is "to improve the means for preventing the gas leaking into the casing containing the driving mechanism" consisting of a cylindrical piston that has a portion that fits the valve casing so as to form a gas-tight seal between the valve casing and the casing containing the driving mechanism. In the case of gas cut-off valves constructed as ball-valves, the lifting element (for the purpose of diminishing the friction between the valve and the lifting element) may be constructed as a rotary disc mounted eccentrically on the rotary member and arranged to roll over the valve when acting upon the latter.

One form of the apparatus (for one gas-flame) is shown in vertical section through the valve casing, whereas the dial of the clockwork and the releasing members for the driving mechanism are shown in elevation. There are also views showing different parts of the clockwork and of the driving mechanism.



Meyer-Keller's Automatic Lamp Lighting and Extinguishing Apparatus.

The mode of operation of the apparatus shown is as follows: The clockwork, which is continually in motion, revolves the disc A, together with the two hands B and C, in the direction of the arrow. Assuming that the lamp is to be lit in the afternoon at 4.30 o'clock, and to be extinguished next day at 9.30 in the morning, then the hands are adjusted accordingly opposite the respective hour divisions on the disc and fixed in position by tightening the screws D. On rotation of the disc, a pin on the pointer B will, in the first place, strike at the predetermined time against a projection E of the lever F in the path of the pointer—thus causing the lever to be turned in the outward direction, and act on the lever G, and turn it, and (through the intermediary of a pivot) also the lever H, likewise in an outward direction, so that the knife edge on the latter lever, and heretofore in engagement with a notch on the disc I, locks the driving mechanism, and is lifted out of the notch on the disc—*i.e.*, is released so that the driving mechanism is unlocked.

The driving mechanism now drives through the spindle J and the sleeve K; the piston L causing same to perform half-a-revolution. The lever F, after the pin of the pointer or clock hand B has moved past the projection E provided on the lever, returns into its original inner position; whereas the levers G H remain in their swung-out position, while the knife edge provided on the lever H is sliding over the periphery of the disc I. When the latter, and consequently the piston L, have executed half-a-revolution, the knife edge, under the action of a spring, drops into engagement with a second notch provided on the disc I—locking it as well as the driving mechanism.

During the rotary movement of the piston L the disc M comes into contact with the ball valve N, and lifts it from its seat—thus permitting gas to pass to the chamber O. When the ball valve is opened, a small arm causes the release of the valve P for the bye-pass, so that it can drop on to its seat; thus cutting off the gas supply to the pilot flame, after the gas passing through the passage Q has been lit by means of the pilot flame.

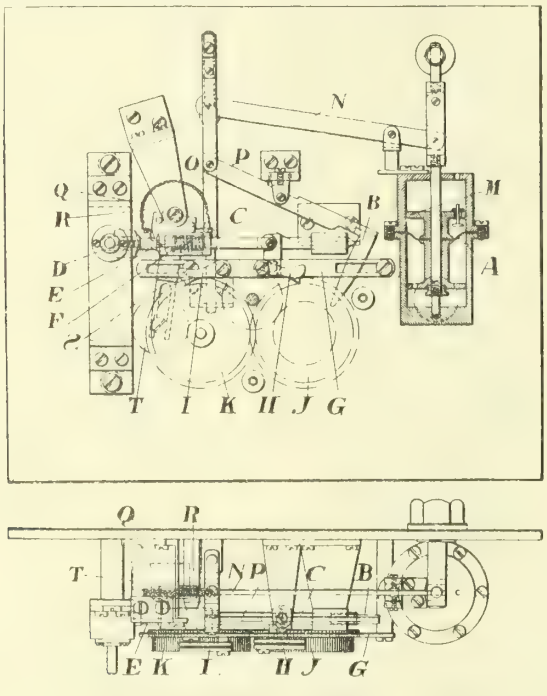
The valve N remains open during the burning period of the lamp—that is, from 4.30 in the afternoon until 9.30 next morning. At 9.30, the pin of the clock hand C will strike against the projection E on the lever F, turning the several parts outwards in the manner described; thus releasing the disc I and the driving mechanism, which now imparts again half-a-revolution to the disc in the same direction as before. This causes the disc M to release the valve N, so that, under the action of its spring, it returns to its closed position and cuts off the supply of gas to the burner; whereas at the same time the valve P is raised and allows gas to pass, so that before the extinguishing of the lamp the gas may be lit by the flame of the lamp, so as to form the pilot flame. At this moment, the knife edge drops into the second notch provided on the disc I, and locks the driving mechanism; so that the supply of gas to the burner remains cut off until 4 30 in the afternoon.

Registering Mechanism of Gas-Meters.

Berry, J., and Glover, W. T., of Oldham, and Meters Limited, of Manchester.

No. 20,352; Sept. 30, 1914.

This invention relates to mechanism of variable pressure gas-meters of the type in which "means are employed in the transmission train between the upshaft or driving shaft and the dial shaft, to compensate in the registering mechanism for the pressure differences."



Berry and Glover's (Meters Limited) Gas-Meters.

In the arrangement illustrated, the movement of the diaphragm A, due to variation in the gas pressure, affects the position of a curved striking plate B, which controls the amount of movement imparted to a member of a differential train of gears, as described in patent No. 7727 of 1911. The striking plate limits the stroke of a plunger-like element C, which is reciprocated through a crank D, connecting the rod E and the spring F. The plunger reciprocates the rod or bar G carrying pawls H I (the former rotating the wheel J and the latter the wheel K. As these wheels are geared together, they receive a forward movement for each direction of traverse of the rod G. They impart a supplementary movement to the member of the differential gear train as described in the earlier patent, "whereby compensation is effected in the indicating mechanism of the meter for the variation in the pressure of the gas passing through the meter."

The diaphragm, by means of the piston-like guiding element M, actuates the lever N which moves the member O (guided at its upper and lower ends), which is connected by a link with the lever P carrying the curved plate B and by a chain Q with a quadrant R, to which is secured an arm S having on it a weight T. Normally the arm rests in a vertical position, corresponding with the out-of-service position of the diaphragm; but the movement of the latter under the gas pressure results in a movement of the weighted arm towards a horizontal position, so that the leverage of the weight increases.

Nozzle Plugs for Fluid Flow Meters.

British Thomson-Houston Company, Limited; a communication from the General Electric Company, of Schenectady, U.S.A.

No. 15,068; June 23, 1914.

This invention relates to nozzle plugs for use in flow meters for creating a pressure difference which varies with variations in the rate of flow of the fluid being metered—nozzle plugs operating on the principle of the Pitot tube.

One object of the invention is to provide a nozzle plug in which the reservoirs, now commonly placed in the piping connecting the nozzle plug and the manometer for maintaining more nearly constant the static pressure heads, are located directly in the base of the plug itself. A further object is to provide such a plug having a single set of leading-in openings, and so designed that it may be adjusted for metering fluids in a pipe, no matter at what angle the pipe extends, or in which direction the flow may be. A still further object is to provide a nozzle plug which can be readily taken apart for cleaning in case it becomes clogged up.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills committed: Lincoln Corporation, Gas and Water Provisional Orders (No. 1).
Bills reported, with amendments: Barnoldswick Water, Dewsbury Corporation, Southend Water.
Bills read a second time: Gas and Water Provisional Orders (No. 2), Gas and Water Provisional Orders (No. 3).
Bill read the third time and passed: Irvine and District Water.
Bills returned from the Commons and agreed to: Chelmsford Gas, Lurgan Urban District Council, Kilmarnock Gas, Prescot Gas, Spennymoor and Tudhoe Gas, Skegness Urban District Gas.

A Committee will meet to-morrow (Wednesday) to consider the Gas and Water Provisional Orders (No. 1) and the Lincoln Corporation Bills.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill reported, with amendments: South Staffordshire Water.
Bill read the first time: Irvine and District Water.
Bills read the third time and passed, with amendments: Kilmarnock Gas (without amendment), Prescot Gas, Spennymoor and Tudhoe Gas.

The Glasgow Corporation Order Confirmation Bill was presented by Mr. M'Kinnon Wood last Thursday.

Coal Prices.

The following question on the subject of coal prices was replied to in the House on Wednesday.

Sir A. Markham asked the President of the Board of Trade whether he was aware that further increased dislocation has resulted in the coal trade owing to his delay in making any definite statement on the question of whether the Government intend to fix maximum prices in the coal trade, and that the London public are not buying coal, in the hope that prices will be regulated; whether he has any information that, unless stocks of coal are laid down through the summer months in London, a coal famine will result if hard weather or fog prevails next winter; whether the stocks at the depôts are small, owing to the merchants not knowing the intention of the Government; and whether he will accept the recommendation made to him by a number of private members of the House and forthwith fix maximum prices.

Mr. Runciman replied that returns furnished by London coal merchants show that at the end of May the amount of coal at London depôts was greater than a year ago. Particulars for the end of June are not yet available. With reference to the remainder of the question, he hoped to be in a position to make a statement to the House very shortly. Matters of great importance to the coal trade and consumers have had to be dealt with by the Government during the past few weeks, which have unavoidably delayed the steps in contemplation for dealing with prices.

Mr. Crooks: Will there be any attempt whatever made to make these people disgorge their "unholy profits?"

Mr. Runciman: On that subject I must refer my hon. friend to the Chancellor of the Exchequer.

Mr. Crooks: The Board of Trade are responsible for the whole mix-up.

Coal Prices and Gas and Residual Prices.

Sir Joseph Walton, on Monday of last week, asked the President of the Board of Trade whether, in view of the fact that gas companies are obtaining cheaper coal owing to State intervention, he would take steps, by legislation or otherwise, with a view to bringing about a corresponding reduction in the price of gas coke, toluol, and other residual products, and also in the price of gas to the consumers.

Mr. Runciman replied: Most gas companies work under sliding-scales which give them a direct interest in keeping the price of gas as low as possible; and I do not think any legislation in the direction suggested by my honourable friend is necessary.

PLYMOUTH CORPORATION BILL.

The gas clauses in the Consolidation Bill of the Plymouth Corporation, which were opposed in the House of Lords [see "JOURNAL," May 11, p. 340], were unopposed when the measure came before the Local Legislation Committee of the House of Commons last Thursday. No alterations in the clauses were made by the Committee; but certain changes have been made by agreement [see "Electricity Supply Memoranda" this week].

DEWSBURY CORPORATION BILL.

This Bill was sent forward for third reading on Monday of last week by a Committee of the House of Lords presided over by Lord RIBBLESDALE. Details of the gas proposals were given at the time the Bill was before the Local Legislation Committee of the House of Commons [see "JOURNAL," March 23, p. 758]; and, as on that occasion, there was no opposition to this portion.

BARNOLDSWICK WATER BILL.

Consideration of this Bill by a House of Lords Committee presided over by Lord RIBBLESDALE has been completed. When the Bill was before the House of Commons [see "JOURNAL," April 27, p. 217], it occupied a considerable amount of time. The chief point discussed before the present Committee was in conjunction with the opposition of the West Riding Rivers Board on the question of the amount of compensation water. The House of Commons Committee decided that this should be one-quarter; but the Rivers Board was persistent and again asked for one-third; which is the figure all other water authorities have conceded in its area. Eventually the Committee granted the Board's request for one-third.

ASHINGTON URBAN DISTRICT COUNCIL BILL.

A Committee of the House of Commons presided over by Sir EDWIN CORNWALL commenced consideration of this Bill on Friday, July 2. The measure has already passed the House of Lords [see "JOURNAL," May 18, p. 411], and the position now is exactly what it was then.

The object of the Bill is to acquire water which rises in the Tosson Springs, some distance outside Ashington. As in the Upper House, the chief opposition was from the Tynemouth Corporation, who again opposed on the ground that they have many thousands of gallons of water available for the needs of Ashington (which is in the Tynemouth bulk-supply area), but a supply can only be given by agreement between the parties. There seems, however, to be no possibility of an agreement being come to; and the efforts of the Tynemouth Corporation were again directed to show that the supply from them would be cheaper than constructing the scheme proposed under the Bill.

The CHAIRMAN, after having heard a good deal of evidence as to the needs of Ashington, said that it would be a grave matter to reject the Bill, as evidently Ashington was in urgent need of a good water supply at the earliest possible moment. At the same time, seeing that the main from the Tosson Springs to Ashington would be to a large extent parallel with the one which the Tynemouth Corporation have laid to Tynemouth from a neighbouring district, it seemed a waste of public money to duplicate works in this way. He threw out a hint to the promoters and to the Tynemouth Corporation that some more serious endeavour should be made to come to terms. With this end in view, he hinted quite early in the proceedings that the Bill might be allowed to proceed with a clause suspending its operation for a period in order to allow a little more breathing space for the parties to confer.

On behalf of the promoters, it was pointed out that considerable delay would occur from this procedure, inasmuch as the Tynemouth Corporation would have to obtain the consent of the ratepayers to supply Ashington, and then come to Parliament for a Provisional Order. On this point, however, some doubt seemed to exist, as Ashington is already in the bulk-supply area of the Tynemouth Corporation, but powers for the compulsory purchase of the land upon which the necessary works could be constructed have expired. Nevertheless it was pointed out by Counsel for Tynemouth that arrangements could be made to acquire the land, and that no difficulty need arise on this point. Seeing that the parties were not very near to an agreement on the point, the case proceeded after Counsel for Tynemouth had offered to take over the distribution of water in Ashington at the Tynemouth rates, which are 40 per cent. cheaper than those Ashington proposes, or would supply in bulk on terms to be decided by arbitration.

The case continued on Tuesday, Wednesday, and Thursday of last week with evidence for the promoters.

The CHAIRMAN, on Thursday, again referred to the possibility of a compromise as between the Council and Tynemouth. He mentioned the Local Government Board report, which deprecated such a large expenditure of public money, having regard to the size of the district to be served, and added that the present conditions, and the conditions for some time to come, must all be against the financial aspect of the scheme. Evidently, some weight was attached to this report; at the same time the Committee confessed that a case had been made out for a new water supply in Ashington.

Mr. BALFOUR BROWNE, K.C., for the Tynemouth Corporation, said he would do his best to try and meet the promoters. He could have no objection to the Bill going forward with a suspensory clause, while the Tynemouth Corporation came to Parliament for the necessary powers.

The CHAIRMAN said the Committee desired to know the most favourable terms Tynemouth were prepared to offer.

Mr. HONORATUS LLOYD, K.C., for the promoters, said he would be in a better position to advise his clients when he knew the terms of Tynemouth's offer. He would be prepared to advise such an arrangement if it enabled an adequate supply of water at a reasonable cost, although at the same time the Ashington Council would prefer to have the supply in their own hands.

This was where the matter was left on Thursday, when the Committee adjourned until to-day (Tuesday).

METROPOLITAN WATER BOARD BILL.

Tramway Companies and Compensation.

A House of Lords Committee presided over by Lord RIBBLESDALE last Tuesday dealt with the Bill promoted by the Metropolitan Water Board. It has already passed the House of Commons Committee [see "JOURNAL," May 11, p. 341]. The sole object of the measure is to authorize the Board to construct six new service reservoirs, eight new aqueducts, together with a well and a pumping-station, and in this connection sanctions £1,000,000 new borrowing powers. In the House of Commons the London and Surrey County Councils opposed, and asked for certain new protective clauses, which, however, the Committee did not grant.

On the present occasion much stronger opposition was offered to the Bill in connection with protection for tramways. The London United Tramways, Limited, the South Metropolitan Electric Light and Tramways Company, and the London County Council all asked for a further measure of protection in respect of possible damage to their tramway undertakings from the laying of the proposed new aqueducts beyond that given in the Water-Works Clauses Act. This was strongly objected to by the promoters. The opponents placed before the Committee a long clause in which they asked for 28 days notice of any works to be carried out under the Act, together with plans and a reference to arbitration in the event of disagreement as to the suitability of the works. The notice and plans were to apply to all works coming within 50 feet of the tramways. Probably, however, the most important part of the clause was that which asked for compensation in the event of any delay or interference with the tramway traffic. This opens up a very important matter both for the tramways and for statutory undertakings which have to open the roads. The promoters argued that a question of this kind is essentially one for general legislation applying to the whole of the country; and it was clear from the commencement that there was no possibility of compromise between the parties.

Evidence was called by the tramway undertakings as to cases where tramway tracks have subsided owing to the operations of water, gas, and electric light undertakings, and in connection with which, under the general law, there is no remedy. In the course of the discussion the parties came to an agreement on most of the points in dispute; but one or two were left for the decision of the Committee. In the first place, it was agreed to accept 14 days' notice with plans. The Chairman pointed out that 50 feet seemed an exceptional distance to include in such a clause. The two Tramway Companies thereupon expressed their contentment with 15 feet; but for the London County Council it was pointed out that the figure was inserted at their instance, owing to the proximity of many of their large sewers. The Committee decided that 15 feet must apply to all opponents.

On the question of compensation for damage through interference with traffic, Mr. Vesey Knox, K.C. (for the Water Board), pointed out that under the Tramway Act of 1870, all tramway undertakings were granted their concessions on the understanding that no claim could be made against other users of the road for interference with traffic, unless such interference could be proved to have been caused by negligence. This condition constituted a bargain between tramway undertakings and Parliament; and it would be unfair in one particular instance like this to vary the bargain.

Eventually the Committee decided that tramway undertakings should be entitled to compensation for loss of traffic due to any operations of the Water Board during construction or the effects of which might be felt for a period of six months after.

LEGAL INTELLIGENCE.

THE BASIS OF WATER-RATES.

A Case at Woking.

At the Woking Petty Sessions, last Saturday week, the Magistrates heard a case in which Mr. C. J. Parker asked them to determine the amount which should form the basis upon which the Woking Water and Gas Company could fix their rate for a supply of water to his dwelling house.

Mr. J. D. CRAWFORD appeared for the applicant; Mr. A. M. PADDON representing the Company.

Mr. CRAWFORD, in opening the case, said that, with the object of saving time and expense, the parties had agreed upon everything it was possible to agree upon. They had agreed to the values—viz., that the gross estimated annual rental should be £130, and the net £109. The only question the Bench would have before them was the construction of the Act of Parliament. Mr. Parker was the owner as well as the occupier of a dwelling-house at Horsell. The Company had claimed that the rate to be paid in respect of water supplied to him should be on the gross rental; and the amount involved was something like 10s. 6d., which Mr. Parker had paid under protest. The Water-Works Clauses Act of 1847 contained a number of provisions which were almost all incorporated into the different Private Acts which were passed. This being so, one had to read that Act into the Woking Act; and it was section 49 of the latter Act that they were particularly concerned with. Where the gross estimated annual rental exceeded £100, the charge was to be at a rate per cent. per annum not exceeding £5. Section 68 of the Water-Works Clauses Act was not expressly included by section 49 of the Woking Act. Section 68 read: "The water-rates, except as hereinafter and in the Special Act mentioned, shall be paid by, and recoverable from, the person requiring or using the supply of water, and shall be payable according to the annual value of the tenements supplied with water; and any dispute arising as to such value the same shall be determined by two justices." This had to be read into, and formed part of, the Woking Act. This particular Act was silent as to the value upon which the rate was to be paid; and it was to be found in section 68 of the 1847 Act. If section 68 was included in the Woking Act, and not expressly excluded, then, he submitted, the value there meant the net annual value; and Mr. Parker, therefore, should pay his water-rate upon the basis of £109, which was the amount of the annual value of his premises. The whole of the argument would fall if it had been put into the Act of Parliament that the rate was to be paid on the gross annual rental; but these words were not in it. In section 49 of the Woking Act no provision was made as to the value upon which the water-rate was to be paid. The provision with regard to gross estimated annual rental was for the purpose of fixing the percentage, but not the value.

Mr. Paddon said the case was one of supreme importance. The Company had been carrying on operations for over thirty years in the district; and this point had never arisen until that moment. Therefore the importance of the case would suggest itself to the Justices. He would submit that the plaintiff had misconstrued the true meaning of clause 49 of the Woking Act; and that the clause was self-contained, complete, and beyond all question in its meaning. The words were in the common form as used in other Water Acts, and stated what the basis should be; and the rate was charged upon this basis. It was clearly stated that it should be at the rate of 5 per cent. on the gross estimated annual rental.

Mr. Crawford, in reply, maintained that the Woking Act was silent as to the manner in which the rate was to be calculated, and left it to the Act of 1847.

The Bench retired to consider their decision, and upon their return stated that they decided upon the amount of £109. They allowed £10 costs.

Mr. Paddon formally announced that the importance of the case would necessitate it being taken elsewhere.

WORKMEN'S COMPENSATION CLAIM.

Liability for a Crushed Hand.

At the Bury County Court, last Tuesday, James Morris, a labourer, formerly employed by the Radcliffe and Pilkington Gas Company, claimed under the Workmen's Compensation Act for injuries sustained while following his employment on Oct. 20, 1913.

Mr. G. Clough (who represented the applicant) said the man was going about his duties with a handcart, when the weight of its load overpowered him, and he fell. He understood that the respondents relied for their defence on a receipt for £8 10s. signed by the applicant on Nov. 13, 1913. The question was whether the receipt was obtained by the respondents from the applicant in such circumstances as would entitle the Court to say that it was not just or equitable that the applicant should be bound by it. He was only a labourer, and had no one to help him. At the end of the week in which the accident occurred, he went to the Gas Company's offices and asked for compensation or some wages. He did not then get any; but the next week and the week after he had 5s. So that all he had to keep himself in the first three weeks was 10s. The next thing he received was a note asking him to attend at the office; and when he did so, he found a representative of an Insurance Company there, who asked him to settle for £5 or £6. He refused; and it was then suggested he should see his doctor. The plaintiff went to the doctor; but he was not at home, and he saw the doctor's dispenser, who was not a qualified man, and who told him that in his opinion the hand would be all right before very long. Having had practically nothing for three weeks, being destitute, and being promised work the moment he was able to take it, he accepted £8 10s. The applicant was, however, incapacitated from following any work for six or seven months, and had not been able to get employment. He was practically only a one-hand man to-day.

His Honour (Judge Spencer Hogg), having heard the applicant's evidence, said that, having regard to the fact that the man went to one who in one sense was unqualified and in another sense was not altogether unqualified, and took his advice, he did not see that he could do anything. It was a very unfortunate case; but he could not help the applicant. There must be an award for the respondents.

Dr. T. Eastham, for the Gas Company, said the insurance company's representative desired him to state that he sent the man to the doctor, and it was on his statement on returning that he offered to give the £8 10s.

A Petition by the Addingham Gas Company.

In the Chancery Division of the High Court of Justice last Tuesday, Mr. Justice Eve heard a petition to restore the name of the Addingham Gas Light Company, Limited, to the register of Joint Stock Companies. Mr. Dighton Pollock, who appeared for the Company, said he applied under section 242 of the Companies Act, 1908. His Lordship, after looking at the petition, said it seemed to contain an extraordinary story. One man had apparently been carrying on business as a limited company without having been registered. Mr. Austen Cartmell, who represented the Board of Trade, offered no objection to the petition. His Lordship remarked that, in spite of what had happened, no great harm had been done. He sanctioned the restoration asked for; the Company undertaking to make the necessary return so as to bring the file up to date.

MISCELLANEOUS NEWS.

THE DEPARTMENTAL COAL COMMITTEE.

Some Points from the General Evidence.

From the recently published minutes of proceedings, there was given in the "Journal" a fortnight ago [p. 765] an account of the evidence tendered by Mr. D. Milne Watson, the General Manager of the Gas Light and Coke Company, to the Committee appointed by the Board of Trade to "inquire into the causes of the present rise in the retail price of coal sold for domestic use." Brief note may now be taken of some of the statements made by the thirty and more other witnesses who were examined during the fifteen sittings of the Committee. It has to be remembered that the evidence relates to matters as they existed in February and March last—when the sittings were held. The members of the Committee were: Mr. Vaughan Nash, C.V.O., C.B. (Chairman); Professor W. J. Ashley, Birmingham University; Mr. J. Boyton, M.P.; Mr. W. Crooks, Labour Member for Woolwich; Mr. J. J. Dent; Mr. A. W. Flux (Director of the Census of Production, Board of Trade); Mr. Stanley Machin; and Mr. J. Rowlands, M.P.

Mr. *H. F. Carlill*, representing the Railway Department of the Board of Trade, was the first witness to appear before the Committee; and he gave evidence as to the rise in the price of coal. He said that between Dec. 1 and Feb. 20 there had been a rise of about 9s. per ton in the retail price of coal in London. This represented something like 30 to 40 per cent.; but, of course, the price might vary from suburb to suburb. Looking at the statistics for the five weeks up to Feb. 14, it would be seen that practically deliveries of coal by rail to London at the moment were normal. But, with sea-borne traffic, things were different. Broadly speaking, the sea-borne coal was for gas-works, electrical undertakings, and industrial purposes. The coal which came from the Tyne was mostly steam and gas coal; the household coal came from the Midlands. Owing to the longer time that coal was taking to travel from the pits to London, he understood coal merchants were now making a higher charge for the use of their trucks, by way of rent. Returns were now being obtained weekly of the quantity of coal raised, the amount delivered, and the stocks. The return for the week ended Feb. 6 (which probably covered about 90 per cent. of the industry, as compared with the same week of the previous year, showed a reduction in the quantity of coal raised of 12·1 per cent., which was a smaller falling off than might have been expected. The stocks at the pits that week were 2¾ million tons. At the close of his evidence, witness remarked: "I am bound to say I do not think I have come across a single figure in the course of this inquiry which was not open to so many qualifications that it tended to disappear altogether."

Mr. *Arthur Watson*, Assistant to the General Manager of the Lancashire and Yorkshire Railway Company, and a member of the Railway Executive Committee, said the supply of coal at depôts in London was heavier than was the case at the corresponding period of the previous year. Speaking of household requirements, his opinion was that there was plenty of coal in London. There was a shortage of trucks; but so far as the railway companies werec oncerned, there was no undue delay in the bringing of household coal to London. The railways had realized the importance of the coal question; but he did not think any of them contemplated that the price to the householder would have reached anything like the figure it had. When it was suggested by some people that this was directly due to want of proper transit on the railway companies' systems, he thought the suggestion was entirely erroneous.

Mr. *John Charrington* and Mr. *G. C. Locket*, the Chairman and late Chairman of the Coal Merchants' Society, who were examined together, gave evidence as to coal costs and prices. At the present time, the price was about 6s. per ton more than the previous year. This was distinctly high; but Mr. Charrington said it was not as high as he expected it to go when war broke out. Ruling out the coal strike, there had not been a recent winter when the price was so high. Speaking generally, there was not the slightest doubt that London was suffering from a great scarcity of supply. The railway companies had a way of showing that they had brought up so many trucks of coal; but they could not differentiate between house and other coal. A large quantity of coal which would formerly have been sea-borne was now coming over the rails. If the railways could have kept things working anything like normally, there would have been not more than 2s. rise above the ordinary price. It was a "scarcity" rise, which had been caused by all sorts of factors. The colliery owners, where there were contracts, had almost all of them cut down the contract quantities on account of shortage of labour; and in a good many cases they had been getting considerably enhanced prices for the quantities they had cut off. Some contracts [shipping contracts] had a war clause; and some of them had a clause whereby deliveries were suspended in case of causes beyond the control of the colliery owner. Mr. Locket quoted instances of coal he had bought at the pit at 9s. a ton more than it was selling at in July. He considered that if the Government fixed maximum prices for the collieries coal and for that of merchants they would be doing a very useful service. But it was a matter bristling with difficulties. To fix the maximum price at which coal was to be sold in London, one must also fix the maximum price at which it was to be sold at the pit. So far as the merchants were concerned, costs of all kinds had gone up. In suggesting a rise of 2s. per ton above the ordinary price, he meant at the pit, not to the public in London, because there were all the extra costs.

Sir *Arthur Markham*, Bart., M.P., who remarked that he had spent his life in the colliery industry, said the last amount of coal that had to be brought to the market to meet the needs of the community determined the price on the whole quantity of coal that was sold. That was to say, if there was a shortage of coal, the last quantity necessary to meet the needs of the market, by the ordinary law of supply and demand, determined the price over the whole quantity. Probably 80 per cent. of the household coal produced at a colliery was sold on contract. Before the outbreak of war, contracts were made on a falling market; and the merchants were to-day receiving probably 80 per cent. of their supplies at these reduced prices. The congestion of traffic had had the effect of to some extent reducing the quantity of coal which would under normal circumstances come to London; but he did not think the congestion of the railways had been responsible for anything like the dislocation of traffic which it was generally thought by the trade had been occasioned. The charge for a waggon was for a journey absolutely, however long it might take. There was no question of demurrage in these times. One could not, and ought not to, get demurrage out of railway companies. To only a very limited extent were the complaints of coal merchants well founded that they could not get their contracts executed, or could only get them executed in part. Asked to give facts as to prices with regard to his own collieries, witness said that, taking the month of January last, there was a colliery producing from 4000 to 5000 tons of coal per day. The selling price was 9s. 4·49d. per ton, and in the corresponding month last year 9s. 6d. If he had made no contracts last summer, the selling price would have been probably increased by 6s. a ton. It was impracticable to deal with the retail trade of London, or any other centre, unless one dealt with the collieries as well. He had suggested in the House that a method by which the Government could fix prices would be by taking the figure at 2s. a ton above the rates prevailing for the same class of coal sold the previous twelve months. No doubt, merchants had got decreased quantities of coal on contracts. Where outputs had decreased, the collieries had decreased quantities accordingly.

Professor ASHLEY: There are three sets of prices, are there not—colliery prices, merchants' prices, and small retail prices?

Witness: No, I think there are four. There is another evil yet. You have not touched the coal-factor, who is the gambler in the market. He does not retail at all: he buys the coal in the hope of a rising market. His object is to force the price up. He is not an important element in the problem quantitatively.

Leaving out the factor, witness said, in answer to further questions, it would be necessary to apply the legislative restrictions to all three classes. The maximum prices he suggested would only last during the time of the war, and come automatically to an end when the war was finished.

Professor ASHLEY: If necessary, you would not hesitate, I take it, to make an enactment regulating the sales?

Witness: The Unreasonable Withholding Act exists already.

Mr. DENT: You cannot compel them to sell, but you can prevent them keeping it.

Mr. *F. Montague Smith*, representing the Associated Coal Consumers (a co-operative society formed to supply shareholders with coal on favourable conditions), stated that they were not getting their contract tonnage from the contractors. He was not buying current-price coal of the same kind from the same colliery that supplied contract coal. He was, however, buying coal of a different quality from that contracted for, at a premium, from those collieries with whom the Society had contracts, and was getting the premium coal, though not the contract coal. Whatever the output of a colliery might be, their contract obligations should be satisfied first, before any coal was sold in the open market. Indeed, for many years these contracts had generally been in favour of the collieries. He would suggest that the collieries should be allowed 1s. per ton extra on all contracts, and that they should be called upon to fulfil the contracts in full before selling in the open market. Personally, he anticipated that prices would be very much higher after the war.

Mr. *J. Hall* next put forward the views of the Royal Arsenal Co-operative Society, of which he is Manager. They, also, in some cases had failed to get their contract quantities. Certain collieries were supplying them with four-fifths of the contract amount, and charging them excess for anything over that.

Mr. *G. C. Locket*, re-called, gave particulars of additional expenses incurred by coal merchants in consequence of the war. The total of these, it was estimated, reached at least 2s. per ton, irrespective of the advance in the price of coal at the pit. Broadly speaking, his opinion was that the difficulty was not in the delivery of coal in London, but in getting the coal to deliver. His deliveries on contracts had been cut down by the collieries. Sliding-scale contracts in theory were quite fair and reasonable; but in practice they did not work well.

The CHAIRMAN: Supposing maximum prices were fixed, what would you consider would be a fair way of adjusting the merchants' price; the colliery owners' price being the datum line, so to speak?

Witness: I think the fair way would be to take the colliery price in June last year, and the selling price in the same month, and take the difference between the two as the normal difference. Then if you fixed the colliery price, and fixed a similar margin between that and the selling price, you would get a margin which is certainly favourable to the consumer, because we generally expect to get a larger margin in the winter than in the summer. But to meet the national emergency, I think it would be fair all round.

Mr. *A. E. Reed*, Mr. *J. V. Nicholls*, and Mr. *A. Meehan* gave evidence as to the functions exercised by the Public Control Department of the London County Council, with regard to the small retailers who deliver coal to the poorer classes. Figures were quoted showing that 2s. and more per hundredweight was being paid for coal in very small quantities. One of the witnesses stated, in answer to a question, that it was his impression that in ordinary winters London was sufficiently provided with coal and coal storage.

Mr. *George Briggs*, Secretary of the Leeds Industrial Co-operative Society (the largest distributive concern in Leeds), said they had had no difficulty as far as getting their supplies of coal from the collieries was concerned. Only one colliery company had given them notice that they could not supply more than two-thirds of their contract amount. The city was rather peculiarly placed, inasmuch as there were several collieries which did a retail trade themselves in Leeds.

Mr. *W. H. Elliott*, representing the Stratford Co-operative Society, stated that he did not think the shortage they had experienced was so much the fault of the collieries as of the railways. Practically all the collieries had sent them an intimation that they could only supply a certain percentage of their contracts. About three-quarters was the proportion offered. It was a singular thing that in some yards one could find coal, while in others there was none at all.

Mr. *James Richardson*, connected with the Inland Collieries Subscription Room, who was questioned at great length regarding price fixing and contracts, said there was no Committee among the coal merchants who decided what price to offer the agents. It was very difficult to say how these things came about; but one got to know by inquiries, and by what people were likely to give, what the figure should be. It seemed to fix itself without any arrangement at all. If the price of coal went up on the London market 9s. per ton, under sliding-scale contracts the collieries would be interested to the extent of 4s. 6d. per ton. This, of course, gave the agents an interest in seeing that prices attained a high level; but they had, as he had said, nothing at all to do with the fixing of the prices, which was done by the Coal Merchants' Association, without any conference at all with the collieries or the colliery agents.

The CHAIRMAN: As regards the lower grades of coal, do you have sliding-scale contracts for them? Does the coal tend to divide itself, as between sliding-scale and flat-rates, into higher and lower grades?

Witness: Yes; our own common coals are nearly all sold for gas making, and purposes of that description; and there is no sliding-scale on these contracts.

Are the gas-works going short now, in order that these lower grades may go elsewhere?—The gas companies are bound to go short at the present time, if all their contracts are fixed (the same as others) with a strike clause.

I mean, is coal being diverted from the gas-works to other classes of consumers?—Yes; I should say so.

What is really happening is that to a certain extent coal which in normal times would be regarded as industrial coal is now used as household coal?—Very largely. A good deal of the industrial coal which is at present going to householders was coal which in other circumstances would have been used for export.

In answer to further questions, witness said that in his case 25 per cent. of the common coals was not contracted for, and could be sold at current prices. A good deal of this was used for gas purposes. Looking ahead, he thought there would be a considerable advance on contracts over what they were made at last summer. Their Continental friends and customers in South America—all the gas companies they supplied out there—must be getting into a very bad condition now; and it would probably take at least a year to make up their deficiencies. The two things depended upon each other so much that the contract price obtainable for coal for gas-works, even in South America, would have a bearing on the household prices here. Even if there were an adequate supply of household coal in prospect for the United Kingdom, the price would still depend to a certain extent upon the contract prices for industrial coal here and in other parts of the world. His collieries were supplying two-thirds of contract amounts, except in one or two instances where the contract had been made for a total consumption, and no monthly quantity fixed. He had heard of one or two cases in which, where contracts were diminished, free coal had been offered to the same people at current prices. This he did not think was fair.

HAMBURG GAS UNDERTAKING.

The Last Report Issued.

The report of the Lighting Committee of the Hamburg Corporation for the year 1913 was published in the "Journal für Gasbeleuchtung" for June 12, and from it the following particulars in regard to the Municipal gas undertaking are taken.

The consumption of gas showed an increase of 2·27 per cent. over that for 1912, which year, however, showed 9·26 per cent. increase over 1911. The relative smallness of the increase in 1913 is attributed partly to generally unfavourable business conditions, depression in building, and increasing adoption of electric lighting; but other important factors in reducing gas consumption were the general adoption, in May, 1913, of a later hour for commencing work in the morning and the greater calorific power of the gas distributed since natural gas has been mixed with the coal gas supply. The output was divided between the three works of the Corporation as follows: Grasbrook 36·1 per cent., Barmbeck 36·9 per cent., and Tiefstack 27 per cent. Natural gas from Neuengamme was first added to the coal gas in 1913; the necessary apparatus for controlling the pressure and mixing the gases having been installed, and the main from Neuengamme to the Tiefstack works having been completed in the summer of that year. The delivery of the mixed gas to consumers from the Tiefstack and the Grasbrook works began in August; the proportion of natural gas added to the coal gas varying between 15 and 20 per cent. Finally, it was decided that 15 per cent. was the most suitable proportion. The composition of the natural gas is 95·42 per cent. methane, 1·26 per cent. heavy hydrocarbons, and 3·32 per cent. nitrogen.

The carburetted water-gas plant at the Barmbeck works was used in the winter months to meet the increased consumption; and thus the load on the coal-gas plant was kept more nearly uniform. The manufacture of carburetted water gas was 6·1 per cent. of the total output of the Barmbeck works. The total quantities of gas produced at the three works in the year 1913 were: Coal gas 3,970,207,062 cubic feet, natural gas 217,761,988 cubic feet, carburetted water gas 97,013,052 cubic feet.

There was an increase of 0·5 per cent. in the number of gas-burners installed by consumers in the course of the year, an increase of 16·8 per cent. in the number of cookers, and of 60·9 per cent. in the number of heating stoves. The use of inverted burners for lighting purposes continued to spread. The number of public gas-lamps at the end of the year was 29,814, as compared with 28,805 at the end of the previous year. The small gas-works at Steinwärder, which supplies some suburbs, had a slight increase in output as compared with the previous year.

HONOUR FOR A GAS WORKER.

Cardiff's V.C.

Mention was made last week of the gratifying fact that Company Sergeant-Major Frederick Barter (of the Special Reserve attached to the 1st Battalion of the Royal Welsh Fusiliers), an employee of the Cardiff Gas Company, had been awarded the Victoria Cross for conspicuous bravery and marked ability at Festubert on May 16. Last Wednesday, he was the recipient of signal marks of appreciation at the hands of those with whom he worked in happier times. Prior to the outbreak of war, he was employed in the stove-shops of the Company; and to mark their regard for him, the office staff and the employees of the Bute Terrace works presented him with a rosewood clock with Westminster chimes, a silver cigarette case and match box, and an automatic lighter. The clock was inscribed:

> Presented to Sergeant-Major Frederick Barter, V.C., by the Officials and Workmen of the Cardiff Gas Company, as a Mark of Appreciation on his being awarded the Victoria Cross. July 7, 1915.

Mr. H. H. Langford (Outdoor Superintendent), who presided over a crowded audience, expressed the pleasure of the staff and workmen at having among them a fellow workmate who was also a war hero. They were very proud of him, and trusted his life would be spared for many years. Mr. George Brown (of the Stove Department) said he had always found Sergeant-Major Barter an excellent workman and a splendid comrade; while Mr. Eli Richards (of the Gas-Fitting Department) remarked that their comrade had brought honour to his fellow-workers. About 110 men had gone from the works; and this was a fair share, reflecting credit on the directorate and on the officials who had treated them so well. Mr. T. Knight said that not only had their hero captured the Germans, but he had found the leads to the mines and severed them, thus saving probably hundreds of lives of his fellow-soldiers. They were proud when he got his D.C.M., but proudest of all at the award of the V.C. On behalf of the office staff, Mr. T. W. Andrews also paid tribute to the V.C.

Mr. George Clarry (Secretary and General Manager of the Company), in responding to an invitation to make the presentation, said it was impossible to recollect an occasion on which they had gathered with greater pleasure than they did that day. They were beginning to learn the value of the work done by the army of workers at home; and never in the history of gas lighting was there such an important time as the present, for it was to the gas industry the country was looking for the explosive that was absolutely necessary to success on the Continent. They all anticipated with pleasure the time when their colleague would be with them again; and he was sure that this also would be the Sergeant-Major's pleasure when away at the front. "Since he has been here," proceeded Mr. Clarry, "I have been shadowing him from day to day and doing what I could to help him and make his week the success he deserves; but let me tell you that his first thought was not of himself nor even of his family. It was, 'How can I help the cause?' Let me tell you what happened to-day at our Board meeting. We took the opportunity of introducing Sergeant-Major Barter to the Directors in his capacity as a soldier; and they were much pleased that one of our employees should have gained so conspicuous an honour—to be the first Cardiff V.C. of the war. You know we are a firm that believes in co-partnership; and I have addressed you on the matter before this. You know you can become shareholders; and our Directors felt so pleased and so honoured that they unanimously decided to make him a co-partner, and to start him with £50 consolidated stock." [Loud cheers.] Before the end of the month, said Mr. Clarry, Sergeant-Major Barter would receive his interest.

Mr. Clarry handed the gifts to the new V.C. amid loud applause. He said they were tangible tokens of their regard; and he hoped the recipient would return and have a long life among them.

Sergeant-Major Barter, rising to respond, said he felt tongue-tied, for the reception had been almost too much for him. He thought the Company had treated him handsomely; and he expressed his warm appreciation of the tributes from the staff and the workmen. He was proud to belong to the Gas Company.

Subsequently the whole party were photographed, with Mr. George Clarry and Sergeant-Major Barter in the centre.

[The above photographs were taken by Mr. H. J. B. Wills, of Cardiff.]

GAS-FITTERS' CERTIFICATES.

Regulations for Issue by the Institution of Gas Engineers.

We have received from Mr. Walter T. Dunn, the Secretary of the Institution of Gas Engineers, the subjoined copies of regulations for the issue of Institution certificates for gas-fitters, and of the candidates' qualifications form referred to therein. These are now being sent to members of affiliated District Associations by the Hon. Secretaries, from whom forms can be obtained, which are returnable to them.

Regulations as to Institution Certificates for Gas-Fitters.

The Council desire to point out that the issue of these certificates is intended to serve as an interim arrangement only, in order to meet the special cases of gas-fitters, over 35 years of age, who, for various reasons, may not desire to sit for the City and Guilds of London Institute Examinations. They hope that as many candidates as possible will enter for the examinations, for which there is no age limit.

Those wishing to obtain these Institution certificates, whether engaged at a gas undertaking or gas fitting business, must apply to the engineer of the gas undertaking in the district where they work.

The engineer is requested to forward the names of candidates to the Hon. Secretary of the respective District Gas Association [see below], who will return the qualifications form for filling in.

(1.) The issue of these certificates is restricted to gas-fitters over 35 years of age.

(2.) Candidates must have been employed for a period of not less than five years consecutively in the service of a gas undertaking or gas-fitting business.

(3.) Certificates will be awarded: (1) On the recommendation of the engineer of the gas undertaking at the place where the candidate is at work; and (2) With the approval of the respective District Gas Associations affiliated to the Institution of Gas Engineers.

(4.) The issue of these certificates will terminate on July 10, 1917.

(5.) Certificates will be awarded: (1) From the results of a *viva voce* examination conducted by the engineer of the gas undertaking of the place where the candidate is at work, or by the nominee of the engineer. (2) From information furnished by the engineer or employer on a candidate's qualifications form to be supplied for the purpose by the District Gas Association.

(6.) Applications for the issue of certificates, duly authenticated by the District Gas Association, to be sent to the Secretary of the Institution of Gas Engineers, No. 39, Victoria Street, Westminster, S.W., for submission to the Council.

(7.) Any questions which are not provided for by these regulations shall be dealt with as may be determined by the Council of the Institution of Gas Engineers.

The names and addresses of the Hon. Secretaries of the affiliated District Gas Associations are as follows:—

Eastern Counties Gas Managers Association	Mr. Joseph Davis, Gas-Works, Gravesend.
Irish Association of Gas Managers	Mr. George Airth, Gas-Works, Dundalk.
Manchester District Institution of Gas Engineers	Mr. G. S. Frith, Gas-Works, Runcorn.
Midland Association of Gas Engineers	Mr. W. G. S. Cranmer, Gas-Works, Willenhall.
North British Association of Gas Managers	Mr. P. B. Watson, Gas-Works, Wishaw.
North of England Gas Managers' Association	Mr. Herbert Lees, Gas-Works, Hexham.
Southern District Association of Gas Engineers	Mr. H. C. Head, No. 19, Staple Garden, Winchester.
Wales and Monmouthshire District Institution of Gas Engineers	Mr. Octavius Thomas, Gas-Works, Pentre, Rhondda.

Candidate's Qualifications Form.

This form (which contains the following questions) is to be filled in, duly signed by the candidate's engineer or employer, and returned to the District Gas Association.

(1) Full name of candidate?
(2) Address?
(3) Date of birth?
(4) Number of years a gas-fitter?
(5) Length of apprenticeship?
(6) Whether candidate has undertaken the entire gas-fitting of a building, and the number of points in same?
(7) Has he fixed and adjusted lamps for outside and inside shop lighting?
(8) Has he (1) fixed gas fires, cookers, radiators; and (2) is he familiar with the construction of the same?
(9) Has he (1) fixed hot-water circulators and geysers; and (2) is he capable of connecting same both to iron and lead pipes?
(10) Has he acted as complaint man for any length of time on the district, either wholly or part time?
(11)* What experience has he had with high-pressure gas?
(12)* What is his experience with gas appliances for industrial purposes?
(13)* Is he familiar with the working and construction of a gas-engine, and the difficulties likely to arise?
(14) Has he had experience of fixing wet and dry meters of various sizes?
(15) Has he had the experience of fixing interior gas fittings and burners for both private and business purposes?
(16) Do you consider the candidate a competent and intelligent gas-fitter with sufficient educational ability to qualify him for the certificate?
(17) District Gas Association to which this form will be sent?

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* Failure to give satisfactory answers to queries Nos. 11, 12, and 13 is not to militate against the candidate if he has had sufficient experience in all other branches.

BIRMINGHAM GAS AND WATER ACCOUNTS.

The City of Birmingham financial "Blue-Book," a copy of which, for the year 1914-15, has been received from Mr. Thomas H. Clare, the City Treasurer, is accompanied by an epitome which contains the following figures relating to the gas and water accounts.

In the Gas Department, the revenue account shows a balance of income in excess of expenditure of £169,638 for 1914-15, carried to the profit and loss account. After providing for annuities, interest, and redemption of debt, the balance of the profit and loss account was £37,351. The amount of capital expended during the year was £43,611. The total expenditure on capital account to March 31 was £2,625,558. The amount standing to the credit of the reserve fund was £88,016; while the gross total of loans negotiated, including annuities, was £2,938,949. The sum provided from revenue for the redemption of debt in 1914-15 was £53,699; and the gross amount provided for redemption of debt to the end of the year was £1,182,692. The balance of loans remaining to be provided for was £1,756,257.

The revenue account of the Water Department for 1914-15 shows a balance of income in excess of expenditure of £217,101, carried to profit and loss account. The profit and loss account shows £88,482 of loss, which has been provided for as follows: Contribution from the borough rate, £65,000; balance carried forward, £23,482. The amount of capital expended during the year under the 1892 Act was £40,566. The total expenditure on capital account to March 31 under the 1875 and 1879 Acts was £2,097,860; and under the Act of 1892, £6,315,304. The gross amount of loans negotiated, including annuities, under the 1875 and 1879 Acts, was £2,097,860; and under the 1892 Act, £6,327,500. The amount provided from revenue for redemption of debt during the year, under the 1875 and 1879 Acts, was £19,951; and under the 1892 Act, £17,188. The gross amount provided for redemption of debt to the end of 1914-15, under the 1875 and 1879 Acts and the 1892 Act, was £395,383. The balance of loans to be provided for under the 1875 and 1879 Acts, was £1,789,723; and under the 1892 Act, £6,240,253.

PRICE OF GAS AT BIRKENHEAD.

Considerable discussion took place at a meeting of the Birkenhead Town Council last Wednesday, when recommendations were submitted by the Gas Committee for increasing the price of gas to consumers within the borough from 2s. 6d. to 2s. 9d. per 1000 cubic feet, and to consumers outside from 2s. 11d. to 3s. 2d.

Alderman J. H. M'Gaul (the Chairman of the Gas Committee) said the increase was necessary owing to the increased cost of coal, &c. Approximately 1d., per 1000 cubic feet brought in £8500 annually. He estimated that coal would cost £21,017 over last year, oil £1000, wages £600, cartage £400, and stores and sundries £1000, making a total increased cost of £24,000. The increased charges for gas would bring in something like £19,250, as the advance of 3d. would only be in force for nine months of the financial year.

Mr. A. W. Willmer questioned the Chairman in regard to the excess of expenditure of £10,600 incurred in conjunction with the gas-works extension scheme. He considered that the Committee had been grossly negligent in regard to this expenditure. The real fact of the matter was that the Gas Committee did not know the exact position of their accounts. He thought they ought to have a proper explanation from the Chairman.

Alderman G. S. Oldam (the Chairman of the Finance Committee) said the contracts had extended over a considerable number of years; and it appeared to the Finance Committee, who investigated the matter, that a proper system of recording the expenditure had not been kept. The Engineer admitted to the Committee that he did not know, without going into the question, how much he had overspent. The Borough Treasurer thought the Engineer knew all about it; and between the two departments the money was spent without special sanction.

Alderman Gaul remarked that the expenditure was first sanctioned in 1908. They then had to wait a long time before they obtained sanction from the Local Government Board. In the meantime, a considerable amount of extra expense had been incurred, owing to the advance in the prices of materials. Competitive estimates were obtained for everything, and were brought before the Cemmittee.

Mr. Willmer observed that Mr. M'Gaul had led the Council to believe the Finance Committee were informed of this expenditure. His own recollection was that the Finance Committee did not know anything about the matter until the money was spent. Did Mr. M'Gaul adhere to his first statement that he knew the estimate had been exceeded?

Mr. D. J. Clarke said he was a member of the Gas Committee in the early days of the scheme; and he knew then that they had over-expended the loans. When the scheme was got to work, someone suggested other improvements; and they over-expended the loan right away.

Mr. W. Egan desired further knowledge of what had been taking place. From what he gathered, the increased price of coal was a secondary consideration.

Alderman Oldam said that the £10,600 had nothing to do with the increased price of coal, as the amount would come out of the reserve fund. The first the Finance Committee knew about the over-expenditure was when the Gas Committee asked for permission to obtain a loan of £10,600. Inquiry was made of the officials; but the Committee were not satisfied. The Borough Treasurer was then instructed to draw up a report. They were still not satisfied, and so a Sub-Committee was appointed. The Gas Committee originally drew up a scheme for a certain kind of plant. In course of time, this plant was superseded by superior machinery at an advanced price. The Finance Committee knew nothing of this; and nothing would have been known, had the Gas Committee not asked for permission to borrow the £10,600.

[The report of the Sub-Committee expressed surprise at the lack of system in the Gas Department in respect of keeping a new works cost-book, showing the amounts expended, and suggested that in future the Borough Treasurer, in addition to being notified of all loans sanctioned, should be advised of the amounts of accepted contracts or other capital expenditure. He should also submit, at least once a quarter, returns to the Finance Committee, and to the Committee concerned, of the progress of expenditure.]

Alderman Oldam asked if any provision was contained in the proposed increased price of gas to make up for the shortage of £10,600 on the working of the gas undertaking up to March 31 last.

Alderman M'Gaul: No.

Alderman Oldam pointed out that this would have to be raised out of the rates, and it would mean an addition of 4d. in the pound. He declined any responsibility for this; and for such a state of affairs to exist was not consistent with the good management of any town. He blamed the Gas Committee, when they knew their estimates were not going to be fulfilled, for not telling the Finance Committee. It was a very serious state of things; and the Finance Committee would immediately have to take into consideration how the amount was to be raised.

Mr. T. L. Dodds said he was sure they all appreciated Alderman Oldam's faithful service as Chairman of the Finance Committee. It was abundantly clear that there had been carelessness on the part of the Gas Committee; and he hoped it would not occur again.

Alderman Oldam remarked that, though the Gas Committee proposed to increase the price of gas, they only provided for a surplus of £3250. This, he maintained, was not sufficient; and he suggested that the price should be increased by 6d., instead of 3d.

Mr. D. R. Rowlands added that last year the gas-works had a net working loss of £2546, instead of an estimated surplus of £13,000; and in order to allocate something to the rates and something to the reduction of price account, they had to dip into the reserves. There was no surplus at all last year.

It was suggested that a special meeting of the Council should be called to consider the matter; but after further discussion this was withdrawn, and the Council thereupon agreed to the Gas Committee's recommendation.

BURNLEY GAS-WORKS RESULTS.

The Burnley Corporation Gas Engineer (Mr. J. P. Leather), in his review of the working of the Gas Department for the year ended March 31 last, states that the gas made was 787,202,000 cubic feet—a decrease on the previous year of 29,844,000 feet, or 3·65 per cent. There was sold 675,675,682 cubic feet, used by street-lamps 69,153,000 feet, and consumed on works 12,622,000 feet, leaving 29,751,318 feet, or 3·77 per cent. of the gas made, unaccounted for. The gas unaccounted for last year was 22,686,664 cubic feet, or 2·77 per cent. of the make.

There are 3506 public lamps, which is an increase of 246. Since the introduction of the military lighting order, 1859 lamps have not been lighted. Gas sold, less discounts, brought in £73,226. Of the gas made, 29 6 per cent. was carburetted water gas. For the production of coal gas 47,330 tons of coal were used; the make of gas working out at 11,702 cubic feet per ton, as compared with 10,725 feet a year ago. For the production of carburetted water gas 519,505 gallons of oil were used, or 2·23 gallons per 1000 cubic feet. Last year the quantity employed was 2·48 gallons per 1000 feet. The average illuminating power of the gas was 16·59 candles. There are 28,885 meters in use; 55 per cent. being of the prepayment type.

MIDDLETON CORPORATION GAS UNDERTAKING.

The report of the Manager of the Middleton (Lancs.) Corporation gas undertaking (Mr. William Rogerson), for the year ended March 31 last, shows that the capital outlay during the year was £1063, £900 of which was spent on new retort-settings. The expenditure on revenue account was £17,216; while the income was £24,671. The result was a gross profit of £7454, and a net profit of £895.

The total quantity of gas made was 144½ million cubic feet, being a decrease of nearly 3 millions, or 1·97 per cent., on last year. The make of gas per ton of coal carbonized reached 12,341 cubic feet, an increase on last year's working of 904 feet, and of 692 feet on the previous record make—this representing a saving of 857 tons of coal on the year's working. The total quantity of gas delivered during the year was nearly 136¼ million cubic feet, which represented a decrease of close on 2 millions on last year. The decrease in sales of gas was attributed to the effects of the war; this being shown by the large falling off in the amount of gas used for industrial purposes—the decrease being over 4¼ million cubic feet. The greater part of the reduction occurred in the early months of the war, when the cotton mills worked fewer hours. Public lighting also showed a decrease. The unaccounted-for gas amounted to 5·28 per cent., against 6 23 per cent. There was a considerable drop in the amount received for residuals; the greatest reduction being in the returns from coke and tar.

After referring to the three new beds of inclined retorts which have been at work the greater part of the year, the report goes on to say that the six old beds of inclined retorts have had temporary repairs carried out to them in order to make them last another season; but a warning is given that certain risks are being incurred in working them. The reason for taking the risk is that owing to the present shortage of labour, had these settings been taken down it was very improbable that the work would have been completed in time for the winter load. The question of the renewal of the plant is also dealt with; Mr. Rogerson stating that "this question will have to be gone into at an early date, and, as the cost of renewal and repairs to the existing plant will be almost equal to a new installation, the advisability of adopting a more up-to-date and efficient method of carbonization is worthy of consideration."

SOWERBY BRIDGE GAS UNDERTAKING.

At a meeting of the Sowerby Bridge Urban District Council last week, it was unanimously resolved to increase the price of gas 6d. per 1000 cubic feet, making the charge for consumers within the Council area 2s. 5d., and for those outside the boundary 3s.

Mr. J. W. Whiteley, in explaining the reasons for the advance, said this was the first time the price had been increased since he became Chairman of the Gas Committee, many years ago. The cause of the advance was the high price of coal, and a shrinkage in the returns they were able to obtain from residuals. The proposed increase of 6d. would not cover the extra cost of production; but by economizing and higher efficiency at the works, it was hoped that at the end of the year they would be able to make ends meet. The coal bill had gone up £5100, which alone was equal to the increase of 6d.; while residuals were realizing £1600 less. Some complaints had been made respecting the quality of the gas. The cause was naphthalene deposits, which had not been dealt with owing to the lack of solvents and the shortage of labour at the works. Owing to the fact that 20 per cent. of their employees had joined the Colours, they were being badly handicapped; and he urged that no more gas workers should be asked to enlist, because it was in the interests of the Government that the works should be kept up to the proper standard.

During the past week, an intimation was received from the Local Government Board stating that, in the present circumstances, they could not sanction a proposal on the part of the Council to borrow £1200 for gas-works extensions.

BRITISH DYES, LIMITED.

At the Statutory Meeting of British Dyes, Limited, which is to be held in Manchester to-day, it is anticipated that Mr. James Falconer, M.P. (the Chairman), will make a general statement as to the progress of affairs during the last three months. Since the Company took over the works of Messrs. Read Holiday and Sons, a great deal has, it is said, been done in the direction of increasing the output of dyestuffs in this country. The question of a site for larger works has been under consideration; and another matter on which Mr. Falconer may be expected to touch is a scheme for research to be carried out at the University of Leeds. For the purposes of scientific research, the Company received a Government grant not to exceed £100,000—to be expended at the discretion of the Directors within a period of the next ten years.

Referring to the last-named matter, the British Science Guild, in their ninth annual report, make the following comment.

The grant for scientific research in connection with the manufacture of dyes was a satisfactory provision of the scheme; but the amount is considered by competent authorities to be quite inadequate to place the British works in a position to compete with those of Germany in the production of new dyes. The scheme restricted competition at home, but made no real attempt to safeguard future competition from abroad, and gave no guarantee in the constitution of the directorate that the industry would be conducted on a sound scientific basis. The Board of Directors did not include a single representative of science; and the Directors nominated by the Government, in virtue of its financial interest in the Company, consisted of a railway director and a civil engineer. The Company was subjected to much criticism from a commercial, as well as a scientific, point of view; and the response on the part of subscribers of capital was so poor that the Directors had to call a special meeting to consider the situation. It was decided to proceed with the Company after certain modifications had been made in the business part of the programme; but the scientific aspects of the scheme will apparently remain unaltered. There is no doubt as to the national necessity for such work as the scheme is intended to promote; but to expect that a Company without a single chemist upon its Board of Directors will be able to compete with the highly-organized coal-tar colour industry of Germany is to disregard the lessons taught by all great enterprises depending upon chemistry for their successful development.

More Yorkshire Price Increases.

The Birstall Council have advanced the price of gas 3d. per 1000 cubic feet all round, to operate from Oct. 1. The prices will then be 3s. 6d. (with the usual 5d. discount for prompt payment) for lighting, 3s. 2d. (with discount at the same rate) for cookers and power, and 3s. 7d. for gas consumed through slot-meters.—The local Gas Company having decided to increase their price 6d. per 1000 cubic feet all round, the Yeadon District Council have instructed the Finance Committee to make inquiries as to the legality of this action, in view of the fact that the Company are spending a considerable amount of money in reconstruction work. It was held that surplus money should be used for the reduction of the price of gas to the public, rather than for increasing the value of the stock.—The Otley Gas Company having intimated that the price will be increased 6d. per 1000 cubic feet from Aug. 1, the Burley-in-Wharfedale Council have decided to advance their price to the public accordingly.—The Sowerby Bridge Council have raised the price of gas, as from the 1st inst., 6d. per 1000 feet; making the charge 2s. 5d. in the Council's area and 3s. in the out-districts supplied.—The New Mills Gas Company have advanced prices for lighting from 4s. 2d. to 4s. 9½d. per 1000 feet, and for cooking, &c., from 3s. 9d. to 4s. 4½d.—The Tickhill (near Rotherham) Gas Company have raised their charge 6d. per 1000 cubic feet.

A blaze occurred at the Keighley Gas-Works last week, when a hot rivet, in use by workmen repairing one of the covers of a purifier, fell into the box and ignited gas which had lodged there. The fire brigade were quickly on the scene; and the outbreak was got under before much damage had been done.

GERMAN GOODS IN DUTCH DISGUISES.

[From the "Ironmonger."]

The cessation of business between Germany and the United Kingdom, ıd the general breakdown of German export trade, have led to the tablishment in Holland of a number of factories, ostensibly Dutch, ıt really owned by Germans, and founded with the express intention passing-off as neutral merchandize what are in effect German wares, ıd of salving at any rate something from the wreck of the Fatherınd's foreign commerce.

Among the articles that are thus passed off through a neutral country ıder false pretences, incandescent gas-mantles occupy a prominent ace. Such mantles have for years been made in Holland to a small tent. But whereas in the eight months from November, 1913, to ıly, 1914, just before the outbreak of the war, the value of the Dutch ports to Britain was only about £3400, in the first eight months of ıe war it rose to £113,000; and there is reason for believing that by r the greater part of this increase is represented by German goods, ther imported ready-made from the Fatherland and repacked in olland, or made in Holland by recently-set-up branches of German ctories.

A case in point has just been brought to our notice. There is established at Sloterdyk, near Amsterdam, a firm calling itself the N. V. autsch Gasgloeilicht Maatschappy, meaning the Gautsch Incandesent Light Company, Limited, which manufactures incandescent gasantles. The wording on the letter-paper of the Gautsch Company, ith the exception of the title, is in English, its correspondence is conucted in the same language, more or less, and we know that consignıents of its mantles have recently reached British ports for tranıipment to other parts of the Empire. As the name Gautsch is not utch, but German, and as we had not previously heard of a firm of ıat name in Holland, we made inquiries on the spot, the result of hich shows that the so-called Dutch Company is a branch of a erman firm, working entirely with German capital, and was dumped own in Holland since the outbreak of the war, "to avoid the difficules of the German export"—some twenty-five young women being ent over from Germany to make the mantles. The irony of the prence lies in the fact that Herr Gautsch, the proprietor, is serving in ıe German Army, but is granted leave periodically to come over to msterdam to see how his business with England is getting on. How istressed he must be to find it flourishing! We can imagine him reırning to his trench, sadly jingling his British sovereigns in his ocket, and turning on the poison gas with increased rancour and a elirious "Gott Strafe England!"

Our contemporary reproduces, from the firm's letter-heading, a picture this mantle factory in Holland; and it shows quite an imposing ınge of buildings.—Ed. J.G.L.]

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *July* 12.

The London tar products market remains steady; but, of course, at this time of the year there are few transactions in pitch. The nominal value of this product is 26s. net per ton; while there are rumours that 27s. per ton has been paid at an outport for shipment next season. All qualities of naphthalene continue in active demand. Prices generally are unchanged. There are large inquiries for creosote for America, for which an excellent price is still obtainable. The latest sales reported have netted 4½d. per gallon at makers' works in bulk.

Sulphate of ammonia continues in a strong position, and the value is £14 7s. 6d. net per ton for 25 per cent. quality, packed into buyers' bags at makers' works.

Tar Products in the Provinces.

July 12.

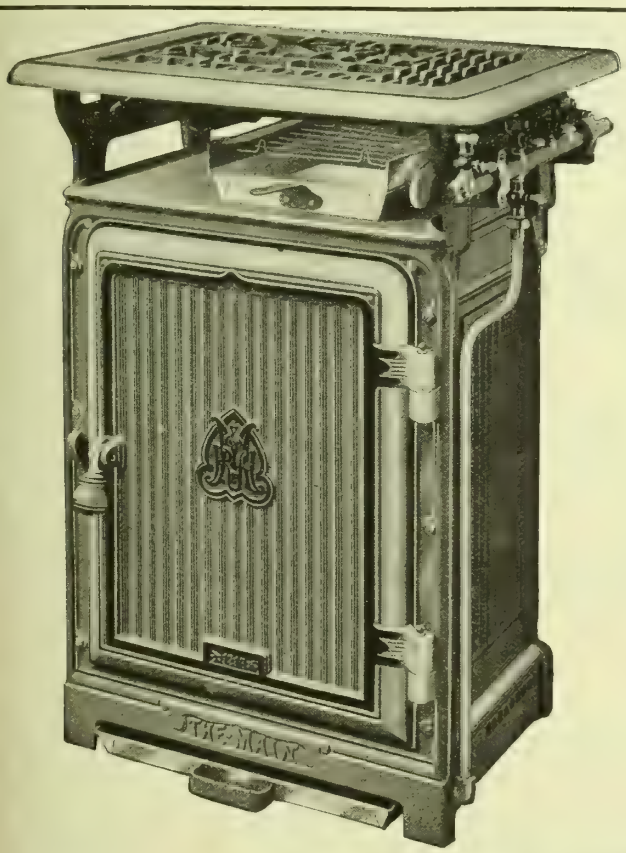
Markets for tar products have remained steady throughout the past week. There is not much business doing in pitch, but makers are still firm in their idea of value. Solvent and heavy naphthas are in very good demand, and high prices are still being paid. Creosote is offering at reasonable prices, but a fair amount of business is reported for delivery up to next March at to-day's figures. Crude carbolic maintains its quotation.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 6d. to 25s. 6d. Pitch, East Coast, 22s. to 23s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. to 24s. Clyde. Benzol, 90 per cent., naked, North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3d. to $3\frac{1}{16}$d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 6d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

Liverpool, *July* 10.

During the past week the tone of the market has become quieter for near delivery, but notwithstanding this fact values have been well maintained at all points. The closing quotations for July shipment are still £14 12s. 6d. per ton f.o.b. Hull, £14 15s. f.o.b. Liverpool, and £15 f.o.b. Leith. There has continued to be a good demand in the forward position, Java buyers having sent further orders; and it is reported that sales have been made at £15 2s. 6d. per ton f.o.b. Liver-



The "Main" Value.

THE "Main" value is good value. First-class workmanship, sensible design, excellence of material—these three combine in the production of "Main" Cookers and make them popular wherever used. Mains can fill your requirements satisfactorily.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N. Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

pool for October-December delivery this year, and at £15 5s. f.o.b. Leith for January-March delivery next year.

Nitrate of Soda.

The market for this article has hardened a little, and quotations have been advanced to 12s. 1½d. per cwt. for ordinary quality, and 12s. 4½d. for refined, on spot.

Sulphate of Ammonia.

From another source it is reported that this market has been very firm throughout the past week, and there has been some rise in the value. Outside London, makes are quoted at £13 15s. to £13 17s. 6d.; Liverpool, £14 12s. 6d. to £14 15s.; Leith, £14 15s.; Middlesbrough, £14 12s. 6d. to £14 15s.; Hull, £14 12s. 6d. to £14 15s. It is reported that £15 has been paid for the forward position.

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COAL TRADE REPORT.

Northern Coal Trade.

There is quietness in the northern coal trade, mainly due to the difficulty of obtaining licences for export to neutral countries; but the home shipments are now heavier—in some cases they are above those of a year ago. In the steam coal trade, the demand is strong for best qualities, and about 20s. to 20s. 9d. per ton f.o.b. is the current quotation for best Northumbrians. For second-class steams, 16s. 9d. per ton is quoted, and the demand seems only moderate. Steam smalls are weaker at 13s. 6d. to 15s. per ton f.o.b., according to the quality—the limited shipments to Russia having an effect on the steam coal trade generally. In the gas coal trade, the inquiry is steady, and there are fuller deliveries being made on the long contracts—a feature which should continue, as the consumption must now be enlarged with the shortening days. Best Durham gas coals are from 20s. to 20s. 6d. per ton f.o.b.; for second-class gas coals, 17s. to 17s. 6d. per ton is the current quotation; and "Wear Specials" are about 21s. per ton f.o.b. The output of gas coals seems well taken up at present. Forward contracts are bad to arrange, though one or two lots have been fixed in the last few days for a Scandinavian town; but the prices have not transpired. The freight of gas coal continues steady at 7s. 6d. from the Tyne to the Thames. Coke is generally firm. Gas coke is well supported by a fair export demand. Prices of gas coke are from 26s. to 29s. per ton f.o.b. in the Tyne, according to the quality.

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The Haworth District Council have transferred gas profits amounting to £1666 to the sinking fund, and have granted a 2s. per week war bonus to the gas-works employees. This transference of profit pays off the last penny of the borrowed money on the gas-works.

The Local Government Board and Extra War Payments.

The Camberwell Borough Council having approached the Loc Government Board for sanction to pay to certain contractors extr amounts owing to the abnormal conditions created by the war, the Boar have replied that, in the exceptional circumstances, should the Counc decide to make any payment to a contractor in excess of the amou due under the contract, its reasonableness should be considered by th Public Auditor at the audit, as in the case of other payments for good supplied or for work done. The Board did not think that payments this kind should be sanctioned by them before the audit, so as to with draw them from the Auditor's review. Under these circumstances, th Council decided to make certain extra payments to their contracto above the contract prices, subject to the contractors giving an unde taking that if the Auditor declined to sanction the extra amount the would refund it to the Council.

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New Gas Show-Rooms at Nottingham.—The Gas Committee the Nottingham Corporation have wisely decided upon a developme of the existing local arrangements for the display of gas lighting an heating apparatus. At present, commodious buildings on Wood borough Road serve the purpose of a general depôt; but the positio is not central, and it has been determined to open large show-room upon premises which have been acquired at the corner of Houndgate on the main line of route from the Midland Station to the centre of th town. The Woodborough Road quarters, where the meter repairer and other officials connected with the distributing department ar located, will continue to be used for the sale of cooking-stoves, &c. but for a display of a lighter and more artistic character, which ha long been needed as an adjunct to the gas undertaking, the new pre mises will provide admirable scope. In the matter of facilities fo the inspection of up-to-date lighting appliances, Nottingham has bee hitherto much behind the times.

Boston Gas Company.—At the recent annual meeting of the Com pany, under the presidency of Mr. W. Pooles, the Directors reporte that the net profits for the year had amounted to £1979, after writing off £1040 for depreciation of plant. The amount standing to the credi of the profit and loss account, after payment of the interim dividend i February, was £7945. Out of this, the Directors recommended th payment of the remainder of the full parliamentary dividend on bot classes of shares, less income-tax, absorbing £1231, and leaving balance to be carried forward of £6713. Reference was made in th report to the successful result of the appeals against increases in th assessment of the Company's property in the Boston, Skirbeck, an Skirbeck Quarter. The total increase was one of £1200; but upo appeal the amount was reduced by £700. The reduction in the pric of gas, which was announced just before the outbreak of war, had bee adhered to; but the purchase of further supplies of coal at the presen high prices would necessitate an advance in the rate charged for ga from November next. The report was adopted.

Careful attention will be given to YOUR enquiries.

R. & J. DEMPSTER, Ltd.,
MANCHESTER.

London Office:
165, Gresham House,
Old Broad St., E.C.

Kendal Gas-Works Results.

In consequence of the great increase in the cost of coal and other naterials, the Kendal Gas Committee propose to increase the price f gas to all classes of consumers 5d. per 1000 cubic feet as from the st inst. The gross profit of the undertaking for the year to March 31 mounts to £3087; and after setting aside £2809 for interest and sinkng fund charges and £53 for war allowances, there remains a surplus f £277. Out of this there has been voted £100 in relief of the rates. The total quantity of coal and cannel carbonized amounted to 8693 ons, being a decrease of 249 tons, or 2·78 per cent., on the preceding welve months. The total quantity of gas made was 97,378,300 cubic eet, an increase of 651,800 cubic feet, or 0·67 per cent. The gas sent ut from the works, as per consumers' meters, was 91,632,400 cubic eet, a decrease of 209,600 cubic feet, or 0·23 per cent. There are at resent 1985 ordinary and 2085 prepayment consumers on the books, howing a net increase of 59 consumers over 1913-14.

Tottenham Council and the Price of Gas.

The Tottenham District Council and the Gas Company have been n negotiation with reference to a recent decision of the Council to efuse an application made by the Company to be relieved from the ndertaking given in 1913 as to the price to be charged for the supply of gas. Sir Corbet Woodall, the Chairman of the Company, wrote to he Clerk of the Council, pointing out the disadvantages under which he undertaking was labouring. The price of coal, he said, was very igh; and the Company had to face heavy charges in respect of pecial bonuses for their men, in order to meet the increased cost of iving, and the payment of the dependants of employees on war service. In addition to suffering the loss of the gas which would have been supplied to tradesmen whose lamps were extinguished by public order, he Company thought it only fair to forego the rent of these lamps, hough there was no corresponding saving in expenses. Sir Corbet Woodall pointed out what would be the effect of the Council refusing o agree to the Company's request. It would mean that the price of gas would have to be advanced in July, 1916, much more than the 4d. now proposed. Having considered this letter, and interviewed Sir Corbet Woodall, the Committee of the District Council suggested, as a compromise, that the price of gas should be raised to 2s. 3d. instead of 2s. 4d. This proposal was accepted; and the Council were recommended to vary their previous decision accordingly. This the Council ubsequently agreed to do.

T.N.T. Limited.—T.N.T. Limited has been registered at Somerset House, with a capital of £3000, in £1 shares, to acquire the benefit of contracts entered into, or to be entered into, between E. J. Fawke and he Secretary of State for War for the manufacture and supply of rotyl, and a licence to use a patent for improvements in the manuacture of trotyl, and to carry on a business in explosives of all kinds The Company is a private one, with offices in Westbourne Grove, W.

Gas-Fitting Instruction in London.

The Board of Education have sent to the London County Council a report on technical instruction relating to the gas industry in the London area. It deals with the extent to which use is made of the existing provision for technical instruction in the subject and with the efficiency of the instruction given at certain institutions, and makes suggestions for the training of gas-fitters' apprentices and students of gas engineering and manufacture. The Education Committee state that the report does not call for any special action on the part of the County Council at the present time, except in regard to the directions in which future developments shall take place. As the Committee understand that there is always a dearth of competent gas-fitters, any schemes of technical training likely to improve the general efficiency are most desirable. A conference has been held between the Council's officers and representatives of the Institution of Gas Engineers; and the Committee have had before them the views of advisory committees and governing bodies of various institutions. Detailed proposals for classes in gas-fitting for both junior and senior students will be considered in connection with the arrangements for next session. Meanwhile, at the present stage, the Education Committee think it desirable to record their opinion (1) that the Westminster Technical Institute should be regarded as the main centre in London for instruction in gas supply and manufacture, and (2) that the question as to the desirability of discontinuing instruction in this subject at the Battersea Polytechnic should be considered at a later date.

War Bonuses and Wage Increases.—A question in the Leeds City Council by Mr. Escritt, dealing with the scope of the General Purposes Committee in relation to applications for increases of wages in the form of war bonuses, elicited the reply from the Town Clerk that such applications which clearly arose out of the war could be dealt with by the Committee without the confirmation of the Council. He ruled that the existing war bonuses were not increases of wages. Alderman Smithson, in moving the adoption of the miuutes of the Committee, remarked that there was no desire on their part to usurp the functions of the Council.

Dublin Gas Company and the Blackrock Council.—Strong objection was taken at a meeting of the Blackrock Urban Council to an increased payment, as proposed by the Alliance and Dublin Consumers-Gas Company, from £610 to £1026 in respect of 327 lamps in the township. Mr. O'Hara said the Company wanted 10s. 6d. for repairs to each lamp; but if they had kept the lamps in proper order, there would be no necessity for the charge. His advice was that, when they got electric light, they should "scrap these lamps." Mr. Callaghan observed that the Company's position was logical; for, if the Council intended to have electric lighting, it was not to be expected that the Company would maintain the lamps. Mr. Stokes thought it was for the Council to challenge the Company to turn off the gas. The consideration of the matter was adjourned.

COMPLETE ROOM
VENTILATION

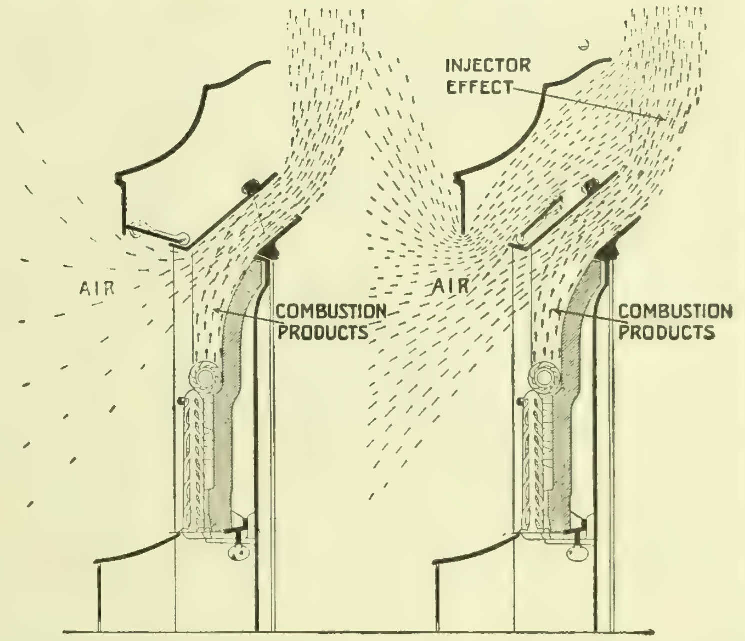
WRIGHT'S PATENT
"INJECTOR-VENTILATING"

invention provides two openings to the chimney (see diagrams). The under or "Injector" one carries off the entire combustion products; the upper or "Ventilating" orifice carries off a large volume of ventilating air, use being made of the ascending current of the combustion-products by the neighbouring outlet to promote, by Injector action, this ventilating function of the upper outlet.

A 1915 Perfectionment.

A most valuable fresh feature in our 1915 "Injector-Ventilating" Gas Fires is the Ventilation-Regulator in the upper or ventilating flue (see diagrams).

JOHN WRIGHT & CO.,
Essex Works, BIRMINGHAM.



VENTILATION-REGULATOR CLOSED. VENTILATION-REGULATOR OPEN

Showing the great additional ventilation effected by the "Injector-Ventilator."

Welsbach Light Company, Limited.—This Company report for the year ended March 31 a net profit of £5096. To this sum has to be added £612 from last year, making £5708, which the Directors recommend be carried forward. A sum of £5000 of new war loan has been applied for, in addition to £5000 of old war loan shown in the balance-sheet. During the year under review, no dividend has been received in respect of the Company's share-holding in the Austrian Company; but it has been ascertained, under due authority, that a dividend of 5 per cent. was declared in December last.

Public Lighting Charges and Restrictions.—The Exmouth Gas Company have sent in a claim for £366, the amount which would be payable to them for public lighting if the lamps had been lit the whole of the quarter. The Urban Council thereupon, having regard to the altered circumstances caused by the Lighting Order, consulted a firm of solicitors, who advised that the claim should be returned with a request that it might be amended in accordance with the existing conditions. At a meeting last Wednesday, the Council referred the question to a Committee, who will confer with the Directors of the Gas Company with the view to an adjustment.

Collectors' Salaries at St. Helens.—An intimation from the Finance Committee that an application by the gas collectors for an increase in salary had been rejected, gave rise to the moving of an amendment to the minutes in the St. Helens Town Council by Mr. Waring, who said he thought the men needed the increase. The Corporation could not blame them if they made trouble, though he did not wish to encourage any man to do so at a time like the present. Alderman Forster, however, pointed out that the men were already receiving the maximum. Mr. Glynn remarked that at the beginning of the war the stokers asked for an increase; but the Manager (Mr. Samuel Glover) appealed to their patriotism, and all went back to their heavy work. If the men who had to strip and labour before the furnaces did not get a rise, he did not think those who had the "soft jobs" were better entitled to one. The amendment was lost.

Restricted Lighting at Felixstowe.—The Lighting Committee reported at the last meeting of the Felixstowe Urban District Council that the agreement come to with the Gas Company in December with respect to the street lighting contract, due to the lighting restrictions, expired by effluxion of time on June 30. The Committee had considered the question, and understood that the Gas Company were prepared to agree to a continuance of the terms. They therefore recommended that the Company be paid at the rate of £25 per quarter so long as the present restrictions of street lighting continued, and that the seven years' contract with them be extended for a period equivalent to the period of the present restriction. Mr. W. F. Cross, in moving the adoption of the report, said the Committee were of opinion that they had made advantageous terms with the Company about fifteen months ago. The Company had hardly started under the contract when the war came on; but they had met the Council very generously. The present arrangement was merely for the time when the lighting entirely ceased. The report was adopted.

Gas Developments, Limited.—A joint-stock company has been registered, under the title of Gas Developments, with a capital of £10,000 in £1 shares, to take over a licence from O. H. N. Gases, Limited, for the production, manufacture, and use of gases [under certain patents in the United Kingdom granted to Professor R. P. Pictet, for improvements in the manufacture of oxygen, hydrogen, nitrogen, and other gases for light, heating, and industrial purposes], and processes employed in connection with the working and using of such improvements [but only so far as relates to the direct or indirect production and utilization of ammonia and its products].

East Surrey Water Company.—The report of the Company for the year ended March 25 states that the profit for the twelve months is £29,458, which, with the balance of £9840 brought forward from the previous year, gives a total of £39,298. Out of this, the Directors have placed £4000 to the renewal and contingency fund (which now stands at £21,993); and they recommend the payment of dividends (less the interim distributions) of 5 per cent. upon the preference shares, 7 per cent. upon the ordinary "B" shares, and 10 per cent. upon the original ordinary "A" shares (less income-tax in all cases). The balance to be carried forward will be £10,023. There has been an addition of 256 consumers during the year, which, it is remarked, may be considered satisfactory, in existing circumstances.

The Price of Gas at Marple.—In the "JOURNAL" a week ago reference was made to the decision of the Marple Gas Committee to increase the price of gas by another 1d. per 1000 cubic feet (making 7d. advance in all) owing to the heavier coal charges. At last week's meeting of the District Council, it was stated that a memorial had been submitted by some of the larger consumers regretting the necessity for the increase; but Mr. Hirst, who replied on behalf of the Gas Committee, said it should be pointed out that, while the price of gas had advanced 20 per cent. in Marple, the price of coal, as charged to the Council, had gone up 40 per cent. The Institution of Gas Engineers were endeavouring to get the price of coal reduced; and if they were successful, the price of gas would again come down. The recommendations of the Committee were approved.

Stockport Corporation Water Undertaking.—The minutes of the Water Committee of the Stockport Town Council, submitted at a meeting of the members last Thursday, stated that the Engineer (Mr. Thos. Molyneux) reported that the Insurance Company had inspected and tested the boilers at Wilmslow, and had reduced the working pressure from 150 to 50 lbs. to the square inch; and that the boilers would consequently be useless for the pumping-station, and would have to be replaced before pumping could be resumed. It was resolved that the consideration of the matter be deferred until after the war. Alderman Johnson (Chairman of the Committee) remarked that the consequence of this was that the station could not be used for any purpose whatever, so far as the water undertaking was concerned. The Committee had had before them the question of equipping the station with an up-to-date pumping installation; and they might have to spend from £15,000 to £20,000.

Important New Developments

Before completing your Season's arrangements for Gas Fires you will be well advised to await full information concerning the important new developments

about to be introduced by the Inventors of the Hygienically Perfect Gas Fire.

The Gas Exhibition Salons,
60, Oxford Street, London, W.

THE DAVIS GAS STOVE Co Ltd

Slight Fire at the Old Kent Road Gas-Works.—The London Fire Brigade on Monday of last week received a call to the works of the South Metropolitan Gas Company in the Old Kent Road. It was found, however, that the outbreak on the first floor of one of the buildings had been efficiently tackled by the Company's staff, and with three private hydrants in use the fire was quickly overcome.

Gas Profits at Lincoln.—Although the annual report of the Gas Committee, presented by Alderman Wallis at last Tuesday's meeting of the Lincoln City Council, showed a large falling off in profits, which amounted to about £4900, or £3021 less than in the preceding year, the diminution was more apparent than real, as it was largely accounted for through the street-lamps not having been lighted to the usual extent, owing to war regulations; so that the Corporation were not losers upon this score. Of the profits, Alderman Wallis explained that £2500 had been applied in reduction of rates. The reserve fund of the undertaking now stood at over £10,000, and he did not think it would be necessary to further increase it. No one could predict what would be the result of the working of the undertaking during the ensuing year. The Committee had placed contracts for 30,000 tons of coal, which would cost them nearly £9000 more than the preceding twelve months.

APPLICATIONS FOR LETTERS PATENT.

9413.—Dempster, R. & J., Limited, and Beard, G. F. H., "Grates of gas-generators." June 28.

9414.—Plumbridge, D. V., "Indicating and recording the composition of gases." June 28.

9437.—Sifton, W. B., "Production of toluene." June 28.

9445.—Gifford, E. C., and Holmes, E. M., "Gas-engines." June 28.

9461.—Fox, H. M., and Bieber and Co., "Gas-stoves for irons." June 29.

9530.—Hall, I., "Furnaces for metals." June 30.

9558.—Bark, B., and Purle, H. W., "Mantles." June 30.

9568.—Ionides, A. C., Jun., "Furnaces." June 30.

9576.—Shepherd, S. H., and Rapaport, I., "Gas apparatus." June 30.

9732.—Kershaw, P. B. W., and Tottenham, E. L., "Regeneration of carbonaceous material." July 3.

GAS COMPANIES IN THE STOCK EXCHANGE.

The course of things last week on the Stock Exchange was rather curious. The pressure of the War Loan on the gilt-edged market became so heavy that some among the choicest securities became absolutely unsaleable. This bore very hardly on those who, having reserves invested in first-class trustee stocks but no available money, desired to realize the former in order to reinvest in the War Loan. Would-be applicants to a considerable sum in the aggregate were thus shut out. In spite, however, of these enforced abstentions, from day to day the conviction that the loan would be an immense success gathered strength. This assurance, coupled with the conquest of German South Africa, the successful action of our Allies in Galicia (illustrating once more the enormous resilient power of Russia), and the general news from the other seats of war, inspired a marked tone of cheerfulness, and gave a bright close to the operations of the week Among markets which made good improvement were the Colonial and Home Rails. Of those connected with warlike commodities, oil and rubber were prominent; the latter being aided by increased production of the article and a good demand. A feature in Banks was a general, though moderate, lowering of dividends, appropriate at a time when values of securities are in the melting-pot. Business in Gas was only very moderate, as might be expected at a season when the weakening of prices was such as to deter all from selling save from absolute necessity. Figures in general were below those of the week before. The Money Market was quiet and easy, but discounts took a harder turn.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 82, 82½, 83, ditto preference 77½, 78, ditto debenture 57, Imperial Continental 53, South Metropolitan 86, 87. On Tuesday, Bombay 5⅜, 5 7/16, Bournemouth "B" 12 5/16, 12 7/16, Gas Light ordinary 83, ditto preference 77½, 78, South African 9. On Wednesday, Eastbourne "B" 110, 110¼, Gas Light ordinary 81½, 81¾, 82, 82⅛, 82¼, 82½, 83, Imperial debenture 69½, 70, South Metropolitan 84½, 86, 86½, ditto debenture 57¾, 58¼, San Paulo debenture 87⅞, 88¼. On Thursday, Bombay 5⅛, 5 5/16, Commercial 4 per cent. 90, European 12½, Gas Light ordinary 82½, ditto debenture 57, 57¼, 57½, 57¾, Primitiva 2¾, 2 13/16, South Metropolitan 84½, 85, Tottenham "A" 124½, 125. On Friday, Bombay 5, Gas Light ordinary, 81, 81¾, 82½, ditto debenture 57¼, 57¾, South Metropolitan 84½, 85, 85½. On Saturday, Bombay 5, Gas Light ordinary 81¼, 81½, 81¾, 82, 82¼, Primitiva 2¾, 2 13/16, South Metropolitan 83½.

Bank rate (fixed Aug. 8), 5 per cent.; last year, 3 per cent.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING JULY 10.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
1,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	..
74,000	"	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
30,000	5	April 29	7½	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	5—5 7/16
50,000	10	Feb. 26	16	Bournemouth Gas and Water 10 p.c. . .	29—30	5 6 8	..
73,480	10	"	7	Bournemouth Gas and Water B 7 p.c. .	15—15½	4 10 4	12 5/16—12 7/16
95,000	10	"	6	Bournemouth Gas and Water Pref. 6 p.c.	13½—14	4 5 9	..
—	—	—	—	Bournemouth Gas and Water Deb. . .	..	—	..
30,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
30,000	"	"	11	Do. New . . .	204—209	5 5 3	..
50,000	"	"	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
06,250	"	June 11	4	Do. 4 p.c. Deb. .	91—93	4 6 0	..
17,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
44,200	"	"	8	Do. A Ord. Stk. .	154—159	5 0 8	..
30,000	20	Mar. 26	12½	British	44—45	5 11 1	..
0,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
45,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
00,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
00,000	10	—	—	Do. 4½ p.c. Pref. .	4—6	—	..
00,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
57,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
13,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	90
60,000	"	"	5¼	Do. 3½ p.c. do. .	103—105	5 1 6	..
75,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 8 11	..
00 000	Stk.	"	4	Continental Union, Ltd.	76—79	5 1 3	..
00 000	"	"	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	..
92,270	Stk.	—	6	Derby Con. Stk. . . .	123—125	4 16 0	..
55,000	"	—	4	Do. Deb. Stk. .	102—104	3 16 11	..
02,180	10	July 29	10	European, Ltd. . . .	17½—18	5 11 1	12½
62,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke 4 p.c. Ord. . .	98—102	4 15 6	81—83
00,000	"	"	3½	Gas Light and Coke 3½ p.c. max. .	76—79	4 8 7	..
62,235	"	"	4	Gas Light and Coke 4 p.c. Con. Pref.	96—99	4 0 10	77½—78
74,850	"	June 11	3	Gas Light and Coke 3 p.c. Con. Deb.	72½—74½	4 0 6	57—57¼
30,000	"	"	10	Gas Light and Coke 10 p.c. Bonds .	..	—	..
58,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16¼—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c. . . .	..	—	..
31,000	Stk.	Mar. 12	7⅞†	Ilford A and C . . .	151—154	5 2 4	..
65,780	"	"	6⅜†	Do. B	115—118	5 8 0	..
65,500	"	June 26	4	Do. 4 p.c. Deb. . .	92—94	4 5 1	..
40,000	Stk.	May 14	9	Imperial Continental .	150—160	5 12 6	53
35,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	69½—70
00,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c. .	119—121	5 7 5	..
61,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. A	211—213	4 13 11	..
18,100	"	"	7	Liverpool 5 p.c. Ord. B	146—14	4 14 7	
06,083	"	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	—

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d	
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd. . .	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	98½—99½	4 10 6	..
529,705	Stk.	June 26	3½	Do 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	..
300,000	Stk.	May 14	8	Oriental, Ltd. . . .	117—122	6 11 2	..
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .	7¼—7¾	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B . .	128—131	4 19 8	..
100,000	50	"	12	Do. C . .	118—121	4 19 2	..
52,000	50	"	10	Do. D . .	..	—	..
249,980	5	April 29	8	Primitiva Ord. . . .	5½—6	6 13 4	2¾—2 13/16
499,960	5	June 26	5	" 5 p.c. Pref. .	4¾—5	5 0 0	..
521,600	100	June 2	4	" 4 p.c. Deb. .	91—93	4 6 0	..
—	—	—	—	" " " 1911	..	—	..
846,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	San Paulo 5 p.c. Deb.	47—49	5 2 0	87⅞—88¼
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 8	..
209,984	"	"	10	Do. B	222—224	4 9 8	..
523,500	"	"	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African . . .	10½—11½	7 16 6	9
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	83¼—87
1,895,445	"	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	57¼—58
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	..
60,000	"	"	5	Do. 5 p.c. Pref. .	110—112	4 9 3	..
—	—	—	—	Do. West Kent. .	..	—	..
137,058	"	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord. . .	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c. .	135—138	5 8 8	124½—125
742,275	"	"	6†	Tottenham District B 3½ p.c. .	115—117	5 2 7	..
181,255	"	June 26	4	Tottenham District 4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅝	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	"	"	6⅞	" B 3½ p.c.	129—134	5 2 7	..
108,075	"	"	5/17/3	" C 3½ p.c.	110—115	5 2 0	..
352,000	"	"	6⅛	Wimbledon 5 p.c. .	117—122	5 0 5	..
98,000	"	"	6⅝	Epsom 5 p.c. . . .	121—126	5 5 2	..
88,416	"	June 26	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

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VOL. CXXXI., No. 2723.] TUESDAY, JULY 20, 1915. [67TH YEAR.

EDWARD ALLEN.—AN APPRECIATION.

A LIFE crowned with honour, integrity, faithfulness, and wide and deep friendships has come to a premature close. Edward Allen is no more in body; but his work and example live in our midst. His memory will be cherished by all who knew him, by all who have felt the cordial shake of his hand, by all who were accustomed to his never failing cheerful greeting, by all who shared his confidences, by all who were brought into contact with him in any walk of life. As we begin this our sorrowful duty, memories have rapid upcoming in which he is the central figure, and which show us how much has been the activity of our friend, how large the place in the professional and the industrial work that has now to be filled. Realization of these things can sometimes only be reached by review; and review is compulsory now. The news of his death in the morning came as a shock last Thursday. It had been known throughout the industry for some fortnight before his death that he was seriously ill; but the vitality and vigour of several years in the place to which merits and high regard had lifted him in the professional and general life of the industry allowed no thought of that place being so early vacated by the Last Call. Only seven weeks ago, he was speaking (the figure and scene are present now) at the meeting of the Institution of Gas Engineers; and since then he has been busy with his voluntary labours for the nation in connection with the High Explosives Committee and the recovery of toluol. His work is finished. Over it may be written in all sincerity and truth—"Well done."

Kindly, genial, and very human was our friend; and for these qualities alone—quite apart from his professional accomplishments and sound practical judgment—he gained the affection of all. He gained that affection because he was what he was; and what he was he could not help being. He was a man of strong convictions. He taught of the higher life in season; in his daily business and professional life, without breathing a word of those things which were of his very soul, he practised the precepts treasured by him, and by so doing gave good example to his teachings. But there was never gloom where he was; he was an example of a cheerful and tolerant man with the deepest religious convictions. To those whose views were not his own on any subject, he was generous, and never displayed bitterness, or showed any of that egotism which denies to others the right of a different opinion. As Engineer of the Liverpool Gas Company (in which post he succeeded Mr. William King), Mr. Allen filled a high position in the gas industry; and he did so with dignity, with conscientiousness, and with an abundant success. He held the confidence of the Board and of the proprietors; and to the staff and workmen there was something, indefinable perhaps but there, which made him to them all more than the Chief Engineer and General Manager. In his technical work for the Company, he was far-sighted; in his commercial bargainings, acute but just. The interests of the Company were his charge, and those who sought business with him found him inflexible on the point of what he conceived to be right and fair. With them all there was courtesy; but firmness prevailed. In gas policy, he was progressive and practical. He chafed under, and sought freedom from, the influences of a long tradition. His foresight and endeavours succeeded; and the Company are in consequence in a stronger position to meet the requirements of the present and the future than ever they were. The reduction of the illuminating power standard, and later the substitution of a calorific value standard, are among the best efforts that have put the concern in a more powerful position for the future. Though occupying a high professional position, there was nothing of the big man about him. He was accessible to all; and his counsel, drawn from the depths of a large experience, was always helpful.

There was one side of Mr. Allen's life which was prominently before us. He was self-sacrificing to a fault; and in this characteristic, and the vigorous interest he took in those things to which he set his hand, may perhaps be traced one cause of the hastening to the end. He worked, given the opportunity, well and consistently for the industry—technically and commercially. One excellent illustration is to be found in his presidential year of the Institution of Gas Engineers. Successor to Sir Corbet Woodall in the seat of highest honour in the profession was a sufficiently difficult position for any man; but he took it as a duty, and in the duty he found pleasure. The first half of his year of office was the second half of the Jubilee year of the Institution. It was the half in which the Great National Gas Exhibition was held at Shepherd's Bush. The President had then much work to do. Even holidays were forfeited in order to devote the days and the weeks to the exhibition and its interests. He also did that year and since a great deal in the parliamentary arena in connection with the interests not only of his own Company but of the industry generally. We do not remember a District Association at one or more of whose meetings during that year—1913-14—he was not present. In the work of the British Commercial Gas Association he took an active part; at gatherings of the Society of British Gas Industries he was an honoured guest. He believed strongly in the cogency of co-operative publicity and educational effort in relation to the broad interests of the industry. Co-operation was with him a principle; and this led him to take active part in the proposals for a scheme of unification of all that was part and parcel of the industry, in order the more effectually to promote and to defend its interests. Indeed, he became an ardent and persistent advocate of whole and not partial central representation. There came the urgent call of the nation, through the High Explosives Committee, to the gas undertakings of the country for special work in the provision of necessaries which were, and still are, required in larger volume. Mr. Allen willingly responded to the invitation to take part in organizing systematic production; and in this, as in other outside honorary or voluntary work, his Directors allowed him very full liberty of action. The Chairman (Mr. H. Wade Deacon, J.P.) and his colleagues felt, apart from the question of patriotic duty, that Mr. Allen's services to the Liverpool Gas Company, extending over fifty years in various positions, entitled him to some freedom in following the bent of his own inclinations and wishes; and it was their desire that he should enjoy more leisure than he permitted himself from official and other duties. On top of all this, our indefatigable friend had engaged to represent the British gas profession and industry at the Gas Congress to be held at San Francisco (in connection with the Panama-Pacific Exposition) in the autumn of this year, on which occasion he was to read a jointly-produced gas paper, of one part of which he was to be the author. Events and work at home induced him to withdraw from undertaking the journey; but we believe the rough draft of his portion of the promised paper had already been partly, if not wholly, prepared.

The life now ended was a full and useful one. The highest motives prompted its actions. With the deepest sorrow we lay to final rest a good friend; and to-day Mrs. Allen and the family are surrounded by the sympathy of a multitude of men who knew and honoured the husband and father.

EDITORIAL NOTES.

Increasing the Market Value of Tar.

In other columns is printed an important and timely (jointly contributed) article headed "The Market Value of Light "Oils and Other Constituents of Tar." The article is something more than the title indicates. Treating gas by tar has become a common practice in British gas-works; and the process it is known—carried out at normal temperature, with a good area of tar surface in relation to the quantity of gas to be treated, and with proper contact—has a considerable effect in transferring from the gas to the tar more light oils than are ordinarily contained in crude tar. If one looks at the tables embodied in the article, there is seen a very important monetary enhancement of the value of tar by the new treatment; and what our contributors are therefore mainly concerned about is that the gas undertakings which do not employ a competent chemist, and have not the necessary plant for making a proper tar-distillation test, shall take such steps as shall ensure to them receipt of the additional value of the tar. The large gas-works can defend themselves in this regard; but it is not so easy for works to do so which are not so powerfully circumstanced. The result is that there has already been over this matter some disagreement with tar distillers which must be adjusted; and adjustment can only be made on the analytical showings of distillation tests. Incidentally, too, the article proves that there is money in the process for the gas maker.

The foregoing indicates the main purpose of the article; but the contribution goes beyond that. It includes suggestions for attempting to improve the current market value of certain constituents of gas-works tar, and then proceeds to discuss various features of the tar-washing process with the view of obtaining from it the best results. The critical point about the whole process is temperature; and an amount of supervision and watching are necessary, in order that it shall not go astray, and the gas extract from the tar constituents which the process aims at supplementing, and not diminishing, in the tar. This reversal of the designed order of things has been an experience at some gas-works. But it can easily be rectified; and means of rectification are also described in the article. Our contributors, it will be seen, have preference—and in many works operation is proceeding this very way—for the use of a tower scrubber, instead of a washer, in carrying-out the process, in view of the large area of tar surface which it is possible by this means to present to the gas. The process, of course, has brought forward fresh conditions; and there are certain matters which gas men would like to see determined. One is as to the degree to which temperatures can be reduced in order to obtain the best financial value from the gas and the tar, and to what extent the composition and (if at all) the stability of the gas are interfered with by the process. Besides the enhancement of the financial value of the tar, one good effect found has been that, where there is efficient tar treatment, naphthalene is completely extracted from the gas.

Price of Coal (Limitation) Bill.

If the coalowners had any idea that the Government had no serious intentions in regard to the regulation of the pithead prices of coal to an amount which would give them the prices realized under similar circumstances during the year ended June, 1914, *plus* a fixed standard addition to cover the increased costs due to the war, they have been befooling themselves. The Price of Coal (Limitation) Bill, which Mr. Runciman introduced to the House of Commons last Tuesday, attests the fact; and there can be no longer any doubt on the subject. The promotion of the Bill, in the form reproduced in our "Parliamentary Intelligence," shows that the President of the Board of Trade in his efforts to come to terms with the coalowners exhausted both his powers of persuasion and his patience. When one looks into the history of the movements of coal prices, and the causes and measure of the movements, it is not difficult to appreciate somewhat the inexorable nature of the difficulties with which Mr. Runciman found himself confronted in trying to induce the coalowners to, during the period of the war and for some months afterwards, give up their liberty in regard to the fixing of prices. The promotion of the Bill, too, alleges, not in word but by the fact, that—despite the assertions as to pits here and there operating at a loss, and other tales intended to excite pity and sympathy or admiration for heroic self-sacrifice, which tales are quoted freely as though representative of the whole—the Government, the further they have gone with their investigations, have become the more satisfied that the war has been unpatriotically made a field of vantage by the coalowners. If they could have satisfied the Government that this was not so, there would have been no necessity for the Bill, which will for ever stand a memorial to the need of the nation's protection against profit-grabbing in these critical and perilous days. If it represents aught else, then we should like to know what it is.

With regard to the clauses of the Bill, the greatest difficulty will be unless the purchaser did business with the same colliery about the same time during 1913 to 1914 to fix the corresponding price of the like coal upon which the standard of 4s. per ton is to be placed. There seems to be something lacking in the Bill in this connection. If any dispute arises as to the corresponding price, the Board of Trade take power to adjudicate, and to call for all the information and documentary evidence required for the purpose. It would be an excellent thing if the coalowners were compelled to publish day by day the corresponding pithead prices, with penalties attaching for default or proved deliberate misstatement. In regard to the proposed standard of 4s. per ton, this is 3d. less than the recently elected Committee of Parliamentary members, with Sir Corbet Woodall as the representative of large purchasers outside the parliamentary ranks, suggested should be the sum. The standard of 4s. shows that the Committee were prepared to act even more generously than the Board of Trade are willing to do, with before them the accumulated mass of evidence as to what is fair in the circumstances. But discretionary power is reserved to the Board to raise the 4s. per ton in special cases. The measure, it is intended, shall also apply to coal contracted for at a price including transit and delivery; and here there will be a second element for determination—that is, the amount of the additional charges beyond the pithead prices. In the case of such contracts, buyers have hitherto frequently been totally unacquainted with the pithead prices; and it might be worth consideration as to whether contracts for coal free on works should not—at any rate during the application of the measure—quote separately the pithead prices and the additional charges. There are coal factors who will not appreciate the control of their business in this manner. The Government, however, have been convinced as to the necessity, and the impossibility of making any difference between transactions with a colliery direct and through an agent. Again, in any dispute with contractors as to how their charges are made up, there is reference to the Board of Trade, whose decision in this (as in other cases) will be final. While the maximum fines for furnishing false information and contravening the measure are placed at the substantial sum of £100, this is a small amount in comparison with the money represented by even a few pence, let alone shillings, per ton under some contracts. And there are gas coal contracts that have recently been made—not at 4s. increase above the pithead price of 1913-14, but at 5s., 6s. and even 7s. per ton in excess. We are not prepared to class all coalowners as unscrupulous plunderers; but it is a salutary provision which will have a retarding effect on those who would evade the measure (when it has passed into law) which gives power to impose upon them a fine to the extent of treble the amount of the difference between the sum demanded and what should have been the maximum price under the terms of the measure.

The Act (when the Bill reaches that state, if Sir Joseph Walton, as a representative coalowner, does not succeed with his interested motion for the rejection of the Bill), it is proposed, shall not apply to exported coal, coal sold for the manufacture of patent briquettes or for use on ships, nor to coal sold under contract prior to the commencement of the Act. The last-named provision is of importance, because contracts have been made in which a clause has been inserted making them subject to any terms laid down in any legislation passed by Parliament. To avoid dispute, an exception should be made of such conditional contracts, so that the plea could not be, as it might be, raised that the Act cancels the condition. It is not surprising that the Act is not to be retrospective, as it would mean that, if some past contracts had to be levelled-down, the coalowners would no doubt claim that Parliament should provide for other contracts made earlier in the year being levelled-up. This is the only reason that occurs to us against the measure being retrospective; and we are quite open to consider, and if substantial to be persuaded by, reasons in favour of the retrospective application which Sir Arthur Markham (who is a colliery owner) regards as correct. However, the non-retrospective clause, it must be admitted, will bear hardly on household coal contracts, seeing that for next winter the greater part of the provision for London has been made. But the Government will no doubt take good care that the coal merchants do not again sweat profits out of householders owing to the existence of the war—particularly out of those who are only able to buy in small quantities—as was the scandalous case last winter, and in which iniquitous gains coalowners shared according to an agreed proportion. There is a point that is not dealt with in the measure; and it is that the coalowners should be made to disgorge, through special taxation, some of the extra profits made since last Christmas, or assured to them by contracts at heavier prices than the 4s. that has been determined by Parliament to be a reasonable increase over the prices of 1913-14.

It will be seen from these comments that there is room for some supplementing of the powers proposed by the measure, which has been forced into being by the imposts of an unregulated and arbitrary ownership.

Mr. Carpenter's High Ideals.

The indispensability of science to industry and of industry to science is an accepted truth, though the practices of industry do not uniformly betray the connection. But it is very rarely now that one hears the man of narrow intelligence attempting a controversion of the indispensability of the one to the other. It is also accepted that in some directions the Germans have beaten us in the industrial race, not because we are short of the scientific talent to devote to wider, deeper, and continuous research, but because there has been an insufficient fusion of that talent with the work of industrial progress. Hard facts compel us to admit, too, that, when Germany has got ahead of this country in any particular respect, through the combination of chemical and industrial research, there has been a disposition for our manufacturers to leave the field almost unchallenged to their more successful competitors. The success of Germany in certain directions has some ratio to British lethargy. All these things are very generally conceded now; but the country goes about the mending of these conditions in a haphazard sort of way. A University is established here, an Imperial Technological College there, a technical school somewhere else, and a National Physical Laboratory elsewhere. They each and all have independent organizations, and arrange their own particular lines of operations. Efficiency is lost through this, as well as by the poor advantage that is taken of their capacity. Everything is disjointed; and no general system controls the scientific and technological provision for the welfare of the country at large. So we shall continue to shuffle along, until something is done to co-ordinate affairs, and to make the most profitable use possible of these various institutions.

Mr. Charles Carpenter, D.Sc., the Chairman of the South Metropolitan Gas Company, has a bolder scheme than this. His ideals are great and far-reaching; and we do not entertain any hope of seeing (however much we might wish it) these ideals attained within our own times. In a paper at the meeting of the Society of Chemical Industry at Manchester last week, he put forward these ideals. Every special industry, he thinks, should build-up its own scheme or institute of technology—not only to provide training for workers, but with fully equipped resources, so that problems of all kinds in connection with the industries could be submitted to these specialized establishments for research. There is so much overlapping of research now, and so much is done that has already been done, that a central institution of the kind in each industry would be a producer of research economy where there is now great waste. Besides this there would be a valuable yield from the continuous penetrating work which is essential to improvement and progress; and from the stores of the accumulated and centralized knowledge, the industries could freely draw. This is fascinating, and all very good indeed if there could be achievement. But is it likely?

The past does not give very much room for hope. We recollect—and the recollection is not exactly a pleasant one—the beating-up that there had to be in amassing sufficient money for the Department of Coal Gas and Fuel Industries at the Leeds University; and there are not many industries with appended to them such a department as this. The need may have been felt; but it has stopped there. There has been no attempt by these industries at founding such departments, and no one seems to have had the courage to try and get the money for the purpose. Mr. Carpenter's heroic measures for marshalling the scientific forces for promoting through the industries the country's greater prosperity would clearly require in the aggregate an enormous amount of hard cash; and yet we are quite prepared to own that the greatest industrial efficiency, economy, and result lie in proper organization. The ideal does not end there. Over all these various industrial scientific centres, Mr. Carpenter would like to have a Royal College of Technology—State-aided and independent—from which would flow control, inspiration, and direction. The aspiration is great; its fulfilment a matter of more than simple doubt. Would it not be better to first see whether anything could be done to obtain, by reorganization and a better distribution of work over the whole of existing institutions, a greater efficiency, and so effect at any rate a part realization of what Mr. Carpenter has framed as the ideal requirement in making the best of the resources of the country to the enhancement of its prosperity? Certain it is we could not afford in these times to set about scrapping present institutions.

The best we can wish Mr. Carpenter is that he may live long enough to witness the materializing of his vision, and with mental capacity then unimpaired, so that he may the more keenly enjoy dwelling upon the fulfilment.

Gas-Engineering Types and Practices.

A series of articles is now appearing in our columns describing the new gas-works of the Hungarian capital—Budapest. There is, we regret to say, a double appropriateness in the articles at the present time; we wish there was only the single one of a description of an excellent piece of modern gas-engineering work on the large scale. It is, however, from the latter point of view that the description must be regarded, because there is in it room for the congratulations of gas engineers to both the Budapest Corporation and their technical gas advisers on the progressiveness embodied in the new works, and of the results of which gas engineers will want to know more anon. Like the consumption of gas, types and methods progress in gas engineering, which progress upsets conceptions and practices, and establishes new ones. In these works at Budapest, one has the plant designed for bulk working and diurnal carbonization. A very considerable amount of money has been spent upon the works; and this expenditure cannot be judged by the ordinary standard of the relation of production to capital outlay. Several reasons exist for this. There appears to have been a large amount of money expended at certain of the old works on carbonizing and other plant, on gasholders at various places, on the land for the new works, and no less than £83,000 was involved in connection with dykes, and in raising the level of the ground, while workmen's dwellings have been erected and a regular colony established in the vicinity of the new works. The Corporation only entered into possession of the undertaking in 1910; and they at once took into consideration the question of what must be done to meet the demands for gas, pending the construction of new works, as well as a scheme for the latter.

The estimates for the works' plans (which the Corporation went to great pains to have verified by some of the best available technical judgment) totalled to £1,667,000. In the result, the expenditure has been, to the extent that the scheme has been carried out, £1,042,000; so that the Corporation have covered by their vote of the larger sum the extensions that are to be made as required to round-off the scheme. The new works, the first section of which has been completed, are designed for an output of 35 million cubic feet per diem; the first instalment being equal to a production of 9,532,000 cubic feet. Here, again, in considering the question of capital expenditure, there is a substantial sum represented in the outlay for work and plant in preparation for the fuller development of the scheme. So that one can well see the impossibility of forming any judgment by the application of the usual standards as to whether or not the work has been economically executed. As a matter of fact, these standards are sometimes vitiated in their application by the fact that the most economical forms of construction in relation to capital expenditure are not necessarily the most economical in the ultimate financial result. By wise extra expenditure upon plant, it may be possible to purchase increased production and working economies which will well repay the additional outlay.

This is undoubtedly the point of view which was kept in particular prominence in designing the new Budapest works; and the economical issues will only be clearly and materially unfolded as the development of the works proceeds. But, although it is said that the works have fully justified themselves in the matters of productive capacity and economy, they have been unfortunate in the restrictions imposed to the making of full demonstration of these things through the intervention of the terrible war. However, in these works, we have a complete reversal of old gas-engineering practice in carbonizing plant and operating method. Here are 78 horizontal chambers on the Koppers system, each of which will hold 10 metric tons of coal—the charges running for twenty-four hours. Think of the time when for gas manufacture small weight and short-hour charges were the vogue, and contrast those practices with the ones adopted by the responsible engineers to the Budapest Corporation, and confirmed by some of the best Continental engineers of the day. Verily, the old order changeth, and gives place to the new, in a strongly marked degree; and the new with time justifies itself against the many difficulties—some actual, some imagined, all largely or wholly amenable to the devisings of engineering talent—which have beset its application for gas-works purposes. Then all these carbonizing chambers are heated from a central installation of twelve Kerpeley producers, of the revolving grate type. The chambers are fed from a reinforced concrete coal tower, capable of holding about 1200 tons of coal. The Koppers direct ammonia recovery process has been installed; so the loss of ammonia is kept to the best realizable minimum. Only a small quantity of liquor has to be treated; and consequently the cost of steam is small. The testimony of the engineer is that the process is both trustworthy and cleanly, as it is carried out almost wholly mechanically. Turbo exhausters and turbo compressors have also been installed; there is electrical plant and electrically operated machinery; there are Diesel oil-engines; there is a works' water supply; and a self-contained completeness is given to the whole by the experimental works and chemical laboratories, fittings shops with machine-tools, workmen's dwellings, and provision for the comfort and health of the men. The pictures which rise in memory of the embodiments of old ideas and practices which at one time were thought good, look strangely insignificant against what is presented by these and other changes.

There are three general points in the articles that are striking. Budapest, as the capital of Hungary, is one of the leading cities in Continental life. But in 1910 the Corporation entered into possession of the gas-works—long after electricity had been a municipal enterprise, and had been doing large part in meeting the artificial illumination and motive power requirements of the city. But so satisfied were the Corporation as to the growing indispensability of the service of gas, that possession of the manufacturing and supply systems was at once followed by the scheme of new works, and the scheme of new works by the vote of £1,667,000. These are points which show confidence, and an appreciation of need, which confidence and appreciation are justified by the fact that in Budapest between 1910 and 1913 the consumption of gas advanced by 32 per cent. We have had pointed out to us occasionally how largely electricity has entered into, and progressed in, the life of the capitals of the world. Nevertheless, the progress of gas is unabated. These facts only mean that enlargement of population, expansion of work, and the development of new applications have provided scope for the two great industries to go forward without any permanent interruption of either the one or the other. Gas is wanted to-day more than ever it was in the pre-electric days. The consequences are that Budapest has constructed its new gas-works on the large scale, Vienna not long ago did the same, the considerable sum voted for like purpose by the Paris Municipality is fresh in memory, Berlin has had material sums spent upon its gas-works in recent years, New York has had an enormous gas-works scheme carried out during comparatively late times. Though London cannot boast of immense new gas-works, it can show a large modernization and an increased productive capacity, as well as the introduction of new systems; and in most of its suburbs, there has been an almost unceasing necessity for extension in order to meet the expansion of populations and requirements. If all the work that has been lately done in connection with the gas systems of London and its environs could be presented in mass, it would show something of very gigantic order. Besides which there are considerable schemes in embryo. All this makes a good story of expanding business and public confidence in the gas industry at home and abroad, in addition to the point as to the expanding business being accompanied by progress in gas-engineering designs and practices which have contributed to progress pursuing the lines of a greater economy.

The South Suburban Meter-Rent Mistake.

The Directors of the South Suburban Gas Company have admitted that an error was made in proposing—at any rate in the present time of high-priced gas—to bring down the meter-rents in the West Kent and Bromley areas to a common level for all sizes of meters, and to double the flat-rate of 3s. in the old South Suburban area, from which is derived the bulkiest part of the Company's business. The admission is in the form of the withdrawal of the circular. Certain points that have been raised on behalf of the Company are discussed in an article appearing on a subsequent page.

Consumers and Ratepayers.

It may frequently be noticed, in connection with debates at council meetings, that opinions are expressed on the subject of capital outlay on gas undertakings, and the return on this outlay to the ratepayers, which show that the speakers may not have fully considered all the facts. A case of the kind may be cited at Burton-on-Trent, where last week, when the annual report of the Gas Committee was submitted to the Town Council, one member said he found there was a total capital outlay of £270,000, for which the ratepayers were only getting a return of £3561. In speaking as he did, and protesting that he was not satisfied, this councillor, of course, had nothing but the welfare of the citizens in mind; but there are one or two other figures bearing upon the matter which, had they been mentioned, would certainly not have had the effect of strengthening his argument. While it is quite correct to say that the accounts show a total capital outlay of over £270,000, it might at the same time be pointed out that this figure is immediately followed by the statement that, of the amount named, £73,436 has been provided out of revenue. Now, who found this sum which has been provided out of revenue? The gas consumers or the ratepayers? Surely, the revenue of the undertaking comes from the pockets of the consumers; and, if so, the ratepayers' claim in the matter may be questioned. To ask for a "return" on an investment which was never made would sound something like a contradiction in terms. And there is yet another point. With a capital expenditure, as aforesaid, of £270,000, the total outstanding debt is now shown in the accounts as £45,167. Even after allowing for the sum provided out of revenue, a goodly amount indeed has been liquidated! Who has provided the money necessary for this liquidation—the gas consumers or the ratepayers? If the present year's profits are the lowest, with one exception, for 35 years, it looks as though there has been no need to call for rates-in-aid; and so the consumers must have been year by year paying off the debt. Again, is it correct to talk of a "return" to the ratepayers on the capital paid off by the consumers? There is £45,000 still outstanding; and to the extent that this constitutes a liability on the ratepayers, they could certainly fairly claim compensation. Will anyone who studies the history of the Burton-on-Trent gas undertaking feel inclined to argue that for this "risk" a sum of £3561 in respect of one year is not a handsome "return?"

Progress of the Dye Scheme.

Although nothing has been made public lately as to the operations of British Dyes, Limited, the silence must not be construed as meaning inactivity. The Board of Directors have two goals before them; and they have been pressing forward to attain them by the most practical of methods. The one is to satisfy the immediate requirements of this country in respect of dye-stuffs, and the other is to make the country independent of Germany in the same direction. There are indications that the German dye-makers do not look with benevolent eye upon these doings. They do not like the appearance of the first amount of solid cash placed at the disposal of the Directors by the shareholders and the Government—£1,018,000. There is something about the rotundity of the figure which proclaims real business; and if the development work answers its purposes, the German makers know there is more money where this sum came from to build-up a big home dye supply. The position is not a happy one for them. That is not this country's worry, nor has it at the present time any sympathy to spare for German manufacturers. Their foreign trade is simply in a state of quiescence; and when they are allowed to make a broader survey of affairs over the current restricted commercial frontiers of Germany, they will discover that the period of their enforced partial idleness has been one of great activity to others. Another indication of their discomposure over the future of their one-time dye supremacy is that they have threatened within the past few days to reduce the supply of dyes to Swiss consumers if the Swiss dye manufacturers export their produce. But the friendly relations of the Swiss manufacturers have a distinct inclination towards this country. The German dye makers have only to thank the foul thing, Prussian militarism, for the awkward position in which they find themselves.

Moving towards the Goals.

It was at the statutory meeting last Tuesday that Mr. James Falconer told the tale as to what the Board had been doing in the matter of satisfying the present dye requirements of the country, and to establish an independence for the future. It has not yet been settled what the Company will have to pay for the works of Messrs. Read Holliday and Sons; but the estimate is £422,000. However, the works are already in the Company's possession; and the output and variety of dyes have already been doubled, and developments are proceeding. Then there are the good relations with Swiss producers, who constitute another source of supply. Of course, the establishment of a complete independence of Germany in this matter is opposed by no mean difficulties; but if brains can overcome difficulties, they are going to be brought under subjection in this instance. While expansion of the productive capacity of the Company is proceeding, the Board are founding a research department, which will be a fine exemplification of the interdependence of science and industry. The Board, too, are also availing themselves of the special arrangements in existence at the Leeds University for the study of dyes. Dr. G. T. Morgan, F.R.S., of the Royal College of Science of Ireland, has been invited to become the head of the research department; and a Technical Committee has been appointed under the chairmanship of Dr. M. O. Forster, F.R.S. This Committee is supplemented by an Advisory Council, constituted of distinguished scientific men, under the chairmanship of Professor Meldola, F.R.S. Among the fourteen members of the Council, we notice Professor Percy F. Frankland, F.R.S., and Professors A. G. Perkin, F.R.S. (Leeds University), and W. H. Perkin, F.R.S. (Oxford University). Thus, through the sons, the name and memory, the diligence, and the perseverance, of Sir William Perkin will be kept before the distinguished group of workers who are to help to do now what this country neglected to do years ago, and which neglect contributed largely to the success of Germany on this and other chemical grounds. The Board have also well in hand a scheme for providing well-trained chemists. In this connection, the information is given that the construction is to be proceeded with at once of new works and the installation of plant of modern type and large capacity. The German dye makers are not happy.

Coke Sales in America.—It seems that in America those who have coke for disposal are faced with much the same problems as in normal times obtain in this country. The "Gas Record" says: "We have new conditions in the coke market of America which make more important than ever the cultivation of a local demand. More coke is being produced now in this country than ever before; and still more is coming in the near future. The solution lies in a careful analysis of your own community—all its domestic and industrial possibilities—and a determination to cover this field with a good fuel at a reasonable figure, *plus* prompt and courteous service. We have with us always the sloths who would sooner dump their output on the market at an upset price, thereby injuring their fellow gas men; and there are the big new coke-ovens with their enormous production to consider. But steady application, each to his particular field, should serve to solve these problems. In addition to his duties as financier, operator, chemist, &c., the gas man must now become an expert canvasser and merchant.

PERSONAL.

Mr. C. F. Farrington has been appointed to succeed his father—the late Mr. T. B. Farrington, of Llandudno, whose death was noticed in the "Journal" for May 11—as Engineer to the Colwyn Water Board, which supplies Colwyn Bay and Conway with water.

OBITUARY.

Mr. A. J. Swain, for some time representative of the Bland Light Syndicate, and who joined the Army in the 2nd King Edward's Horse soon after the outbreak of war, has been killed while on duty in the trenches with the Canadian contingent.

The death occurred last week, in a Leeds nursing home, of Mr. Mark Dalton Wordsworth, who for the past three years has been Assistant-Manager at the New Wortley Gas-Works of the Leeds Corporation. Mr. Wordsworth was only 31 years of age. He began in the service as a boy, and had become very popular with both the officials and workmen.

On the 6th inst., at Bournemouth, Mr. Walter Benson passed away in his 62nd year. He was for many years Chairman of Messrs. D. Hulett and Co., Limited, of High Holborn, and was also on the Boards of Messrs. Kirkham, Hulett, and Chandler, Limited, the Herne Bay Gas Company, and the Barking Gas Company, till its absorption a short time since by the Gas Light and Coke Company.

A FIFTY YEARS' REVIEW.

From Messrs. J. G. Hammond and Co., Limited, we have just received Part I. of "Gas Engineering and Gas Manufacture: A Review of the Work of the Institution of Gas Engineers." Without the secondary part of the title, the first part would have been inadequate, seeing that much more than engineering and manufacture is comprised in the work of the Institution. To make a review over half a century of the work of an Institution which has stood as the central organization of such an ever-expanding industry as that of gas manufacture and supply is no light task; and probably now that he has completed his self-imposed labours, Mr. Charles W. Hastings, the editor and compiler, would be loth to again begin a similar piece of work. It has, however, a measure of value—both technically and historically. It is true that much of the technical and commercial work of the past has been superseded by modern practices; and energy is now being devoted, by the force of circumstances and the growth of knowledge and experience, to the gaining of new economic territory for the gas industry—by developing upon the present conditions. Nevertheless, many of those who are now engaged in this work have but a very slight acquaintance with the roads along which their predecessors have travelled; and therefore there will be interest for them in the present outline (incomplete though it may be) of the history of the work of the Institution, in that this history partially traces the advance of the technical affairs of the industry. We cannot, however, recommend the work as presenting any consecutive history of the development of any particular subject; and therefore in subscribing to it, readers must take it for what it is—an epitome of proceedings and nothing more. As such, there is much value in what Mr. Hastings has done for many busy present-day workers, who perhaps, at the jubilee celebrations of the Institution, were not altogether displeased that they were not of the founders of the organization. Besides the technical and commercial work of the Institution, its domestic side—the tale of its progress, with alternations of calm, storm, and schism—is presented by the reviewer.

The work (comprising some 400 pages) will be completed in six parts, price 2s. each, net. It "reviews"—fairly well in some cases, imperfectly in others—fifty addresses and some 450 papers. Portraits are given of the Presidents, and interspersed are personal and biographical notes regarding the leaders of the profession and industry. The work again brings before readers many of the old-time members of the industry; and, in this connection, seeing that the original source of information concerning the proceedings of the central organization was the "Journal" (the "Transactions" have always been reproduced so far as the meetings are concerned from our columns), it may be claimed that Mr. Hastings is under some obligation to us for his early particulars. There was acknowledgment of this at the meeting in 1878 when Mr. (now Sir) Corbet Woodall was in the chair. We venture to extract from the review a reference by Mr. Hastings (which we appreciate) to the acknowledging incident on that occasion:

> Mr. Livesey [afterwards Sir George] addressed the meeting on the kindness they had received at the hands of Mr. W. B. King, the [then] Editor of the "Journal of Gas Lighting," and said it was their bounden duty duly to express their hearty thanks to him, for without his generosity the Association would have found before this that the half-a-guinea subscription was insufficient to meet their expenses. Mr. Woodall, in putting the motion from the chair, said they all felt such personal friendship and regard for Mr. King, and such interest in the work that he was doing, that it was very pleasant to see him among them. The motion was carried unanimously. Mr. King, in reply, said that it had been

> his happiness to attend every meeting of the Association since the first gathering in Manchester in 1863; and he had personally reported the proceedings each year until now the state of his health prevented him from undertaking the labour. He was glad, however, to be present, and, with the aid of his friend, to continue his work. To the regret of every member of the Association, he was never with them again; for he passed away before the 1879 conference was held. His son (Mr. Walter King) succeeded him; and, so far as we know, he, like his father, has attended every meeting from that date to the present year.

May the present writer [not Mr. King himself] add to the foregoing, "with one exception, through illness."

There is one criticism of the work to make; and it is that it is a pity the technical part of the proceedings of the fifty meetings are reviewed chronologically. Chronological arrangement is all very well for a sketch of the general proceedings; but in regard to the technical history, it would have added to the intrinsic value of the review, if the matter had been subjected to separate treatment, and classified in respect of subject. As it is, we have a "glorious mixture" of technical subjects; and it will greatly depend on the character of the index whether effective relief is given from this condition. In places, the information as to technical contributions is very scrappy. As an example, in the review of the meeting held in 1868, when Thomas G. Barlow, the then Editor of the "JOURNAL," was President, we read: "Dr. Odling delivered a lecture on 'Some of the Constituents of Coal Gas;'" and "Mr. Thos. Methven proved the 'Necessity and Advantages of Regulation of Gas Consumed in Public Lamps.'" These allusions are not very satisfying in the information they present; and similar examples are fairly plentiful.

PAISLEY AND ITS GAS SUPPLY.

Fifty Years' Work of Mr. G. R. Hislop.

IT was a happy idea on the part of Mr. G. R. Hislop to commemorate the completion by him of fifty years' work as Engineer and Manager of the Paisley Corporation Gas Department by the preparation of a historical record of the undertakiing, which an equally happy inspiration had prompted him to dedicate to the Provost, Magistrates, and Councillors of the Burgh. What those with whom he has for so long a time been associated have done to celebrate the event, and to testify to the esteem in which their veteran Gas Engineer is held, will be found recorded in another part of this issue.

What is before us at the moment is the history of the Paisley gas undertaking which Mr. Hislop has compiled; and, as to this, it may be said that he has done his work as he seems to have done all else to which he has set his hand—thoroughly. Friends of the author into whose possession this well-got-up little volume may come will find among the very first pages an additional reason for treasuring it, in the shape of an excellent portrait of Mr. Hislop himself. The fifty years during which Mr. Hislop has been in charge of the works cover more than half the time over which the history of the gas supply of Paisley extends. The original Gas Company was formed in 1823; gas being supplied for the first time early the following year. A period of 22 years elapsed before the transfer of the concern to the Board of Gas Light Commissioners; and when this event took place, the first manager was still in office. As a matter of fact, there had been only three managers when, in the spring of 1865, Mr. Hislop was appointed to succeed Mr. William Foulis, father of the late Mr. William Foulis, of Glasgow.

Prior to this time Mr. Hislop had been manager at Coatbridge, at Lanark, and at Falkirk. He served for five years under the Board of Gas Light Commissioners, in terms of the Act of 1845, whereby the whole of the undertaking would in course of time become the property of the town by the redemption of the entire capital invested out of the surplus profits accruing annually. The terms of purchase were a premium of 60 per cent.; and until redeemed 6·4 per cent. per annum was to be paid. The redemption scheme provided for a relatively increasing representation upon the Board of the members of the Town Council as the capital was redeemed; so that, at the transfer to the town in 1870, there were four members of Council out of twelve constituting the Board of Management.

The beginnings of the gas supply of Paisley were small; the quantity of gas produced during the first year being a little over 5 million cubic feet, and the price charged 11s. 4d. per 1000 feet. That in the early days of gas lighting the value of encouragement as an aid to good service was appreciated, is shown by the following statement extracted from a report issued in 1836 by a Sub-Committee of Directors appointed to suggest measures calculated to promote the respectability and comfort of the workers and their families: "It was agreed to recommend that the Committee of Management take into consideration some mode of encouraging the well-behaved and industrious, either by premiums to such individuals, by pecuniary assistance in time of sickness, or by the formation of a savings bank, with perhaps 4 per cent. interest, which would be open to all in the employment of the Company." Passing on, it is noticed that in 1842 the manager (Mr. Archibald Cook) reported upon some experiments he had carried out with dried coal, and also with peat and tar for the production of gas; and he was instructed to purchase 100 tons of peat for the purpose of carrying out further investigations. The idea was that the peat should be steeped in the tar, and charged into the retorts; but the experiments were subsequently stated to have been unsatisfactory.

Shortly after the Board of Commissioners had taken over the works, a visit was paid to Johnstone to inspect a gas-exhauster, invented by the manager there—Mr. Blair, the father of the late Mr. William Blair, of Helensburgh. This was driven by the draught of the chimney; and in 1850 it was pronounced successful. Three years later, the first telescopic gasholder was erected, to contain 175,000 cubic feet. That the inauguration of this holder was an event, not only in the history of the undertaking, but in that of the town itself, is proved by the following: "After the holder was completed, an opening was left in the crown sheeting, and a gangway led to the bottom of the tank (22 feet deep), which was covered with boarding, while the interior was decorated with flags, and a banquet held therein. On the following night, a grand dance was given by the Gas Commissioners to all the officials and contractors, and kept up till morning." There was another dinner the following year—this time given by the contractors who had installed a new exhauster, invented by Mr. Wilkie, which consisted of an 18-inch pumping cylinder, and was driven by a table engine with fly-wheel and belt. This effected a saving of 15 per cent. in gas made. While on the question of saving, it is interesting to read that next year "the loss due to condensation and leakage reached the maximum of 30·65 per cent. of the gas made."

In 1870 the works were transferred to the Town Council; and the two following years they were largely remodelled and extended. Thus, from his early connection with the undertaking Mr. Hislop has had a busy time—he was, as already stated, appointed in 1865, when the consumption of gas was 55¾ million cubic feet per annum. His patent furnaces for re-burning spent purifying-lime were adopted in 1877, by which time the yearly consumption of gas had reached 107 million cubic feet, thus necessitating the erection of an additional telescopic gasholder of 640,000 feet capacity—a pretty large holder for those days. The record of extensions continues; and special mention is made [year 1878] of a set of four purifiers, each 36 feet by 30 feet, which "were at that time the largest in Great Britain, with the exception of the 40-feet round ones in the Beckton works of the Gas Light and Coke Company. It is added that "the size of these Paisley purifiers became the subject of a controversy, in the pages of the London 'GAS JOURNAL;' but the wisdom of their apparent extravagance in size has long since been fully acknowledged, and the principle universally adopted." When the Tay Bridge collapsed in the following year, the first telescopic holder, which was built in 1854, was blown down; but it was re-erected.

Another important stage in the history of the undertaking was reached in 1885, when, Mr. Hislop's patent regenerative system of heating the retorts having been installed, the fuel account was reduced by 40 per cent., with the result that the price of gas was lowered from 3s. 9d. to 3s. 4d.; the surplus profits being 1s. 1·36d. per 1000 cubic feet. In each of the three succeeding years the price was reduced a further 2d., making it 2s. 10d. per 1000 cubic feet. The next holder to be inaugurated was a 1½ million cubic feet one, in 1890. It was decided in 1896 to adopt Mr. William Young's oil-gas plant, upon the lines of a carburetted water-gas plant as opposed to the horizontal system; and two years later it was agreed by the Committee to supply prepayment meters to the small consumers. Other extensions came along; and then in 1901, after incandescent gas-burners had been adopted in some of the streets, the quality of the gas was reduced from 26 to 25 candles. Within the three succeeding years it was lowered to 20 candles, thus obviating the use of oil gas and cannel coal.

De Brouwer charging machinery and coal and coke handling plant were installed in 1906 and 1907; and since that time much other work has been carried out. A carburetted water-gas plant is now due to be installed; but the condition of trade and the cost of materials have made postponement a necessity. The make of gas, which in 1870 was 86 million cubic feet, was for the year ended May last 519½ million feet; while the loss from condensation and leakage has been reduced from 17·26 per cent. in 1865 to 6·93 per cent. this year, and in the same period the make of gas per ton of coal has risen from 10,047 to 11,748 cubic feet. The book value of the undertaking at May 15 last was £208,702, and the amount of loans outstanding £133,923.

A series of photographs fittingly concludes this souvenir of an interesting event in connection with the gas supply of Paisley.

Professor Lewes on High Explosives.—In the course of his second lecture on "Modern Munitions of War," delivered last Wednesday before the Royal Society of Arts, Professor Vivian B. Lewes, dealing with high-explosive shells, said the material used for charging these was obtained from coal-tar derivatives. In distilling coal tar, carbolic acid was secured, which, under the action of nitric acid, yielded picric acid. The use of this was developed by various investigators; and subsequently Germany hit upon trinitrotoluol. Toluol was an aromatic hydrocarbon obtained from tar oils; and its yield depended upon the temperature at which the carbonization of the coal was effected. When the coal was distilled at high temperatures, the yield of toluol fell. He added that toluol, when nitrified, was a crystal which had the appearance of brown sugar; and specimens were exhibited of this and of trinitrotoluol pressed in the shape of small hard cylinders. Professor Lewes remarked that this was a beautiful explosive. Ammonal was trinitrotoluol mixed with a further proportion of nitrates, and was stronger than trinitrotoluol itself.

EDWARD ALLEN.

Widespread regret in the gas industry and in the City of Liverpool, with which he had been closely associated all his life, is felt at the death last Thursday, in his 66th year, of Mr. Edward Allen, M.Inst.C.E., Chief Engineer to the Liverpool Gas Company. Always a busy man, he had lately taken on further work in connection with Government requirements—having been appointed a member of Lord Moulton's High Explosives Committee; and it is regarded as likely that the added strain imposed upon him by thus "doing his bit" for his country in its hour of trial, led to the breakdown in health which, after three weeks' illness, has now had a fatal termination. The sad event occurred at his residence, "Glentruan," Aigburth Road, and deep sympathy will be extended to the family in their sorrow.

Mr. Allen, who was born in Liverpool in 1850, was educated at the Liverpool Institute, and then, at the age of fourteen, joined the staff of the Liverpool Gas Company—serving his articles and receiving his training as a gas engineer under the late Mr. Alfred King and his son Mr. William King, the Company's Engineer. For some time he held the position of Resident Engineer of the Company's Linacre works, in the construction of which he was engaged; and in 1889 he was appointed Chief Assistant Engineer. It was upon the retirement of Mr. William King in 1904 that the Directors appointed Mr. Allen to the important post of Chief Engineer—a position he has since filled in a manner which has merited, and has received due recognition at the hands of the Board. He was, as Chief Engineer, responsible for many additions and modern improvements to the works and plant of the Company. Much of this plant, it will be recalled, was described in the pages of the "Journal" in connection with the meeting of the Institution of Gas Engineers in Liverpool last year. Among other things, reference was then made to the "Dryco" system of coke cooling, in accordance with the patent of Messrs. Allen and Gibson (the present Assistant Engineer of the Company.)

Mention of this meeting in Liverpool takes matters down to what Mr. Allen himself must have considered as being one of the outstanding periods of his career; for that gathering brought to a close his year of office as President of the Institution of Gas Engineers, and a year of strenuous work on behalf of the gas industry. Following Sir Corbet Woodall in the chair, he was President during the time of that great co-operative effort, the National Gas Exhibition. And his connection with the exhibition did not end with his being at the head of the Institution; for he was at the same time, according to the then rule, President of the British Commercial Gas Association. As a matter of fact, it was no doubt due to Mr. Allen's initiation that the departure was made from constituting the President of the Institution of Gas Engineers President of the British Commercial Gas Association, and of going to the ranks of the Commercial Association for the purpose—the first President under the new order of things being Bailie Thomas Paxton, of Glasgow, who, in consequence of the war, still occupies the chair. In addition to being a member of the Institution of Civil Engineers, Mr. Allen was a Past-President of the Liverpool Engineering Society, before which body his Inaugural Address, which he delivered in the year 1910, was mainly devoted to the progress of his Company and of the gas industry generally.

Another fact which served to make 1914 an important year in the life of Mr. Allen was that he then reached his fiftieth year of service with the Liverpool Gas Company—an event which was signalized during the week of the Institution meeting by the presentation of a gold cup by members of the Council and Committees to Mr. and Mrs. Allen, "as a token of their personal esteem for the President, in commemoration of his fiftieth year of service with the Gas Company, and as a memento of the forty-first anniversary of their wedding day." Later in the year, his staff presented him with a set of entrée dishes, "as a token of their respect and esteem on the occasion of his completion of fifty years' service;" and advantage was taken of the opportunity to bear testimony to the kindness and consideration he had always shown towards those under his control, and to the warm regard and affection in which he was held by all the members of the staff. Reference was also made to the great improvements introduced by Mr. Allen in the manufacturing plant under his charge by the adoption of modern systems and labour-saving appliances, and to the great honours which had been so deservedly bestowed upon him in recent years. Subsequently these gifts were added to by the presentation by the Directors of the Company of a handsome silver candelabrum, "as a mark of their confidence and esteem, on the completion by him of fifty years in the service of the Company [1915]."

The idea of a central gas organization, started some years ago in the "Journal" and subsequently followed up by Mr. J. W. Helps in his Presidential Address to the Institution of Gas Engineers in 1910, always had Mr. Allen's cordial support; and in a speech at the dinner of the Society of British Gas Industries, in March last year, he remarked that, though a scheme for the formation of a Joint Committee which would represent the whole gas industry was for the present in abeyance, the spirit of the movement was alive, and was very strongly in evidence. Mr. Allen's interest in the subject of illumination was apparent in the report which he presented at the annual meeting last January of the National Illumination Committee of Great Britain; and his views on testing were fully explained to Parliamentary Committees in connection with the "Standard Burner Bill," under which the Liverpool and other gas companies secured the adoption of the "Metropolitan" No. 2 burner for testing, and then again last year, when his Company obtained the calorific value in place of the illuminating power standard. As a matter of fact, the calorific power clause in the Act of the Liverpool Gas Company constituted the first deviation from the terms of the Gas Light and Coke Company's clause which was settled the same session. What was then done by the Committee thus created a precedent for variation in the case of companies in connection with which special circumstances could be shown as justifying some departure from what is now the model standard. Among other local work must be remembered the transfer of the Fazakerley Gas-Works of the Corporation of Liverpool to his Company, partly as the result of his negotiations with the Corporation for the settlement of their opposition to the Company's Bill. While, again, of a wider scope, may be mentioned his evidence last July, on behalf of the gas industry, before the Departmental Committee appointed by the Local Government Board to consider the question of Smoke Abatement.

In social and church matters, the loss of Mr. Allen will also be keenly felt, holding, as he did, very high positions in the Wesleyan communion. Football and music are stated to have been his recreations; and it is with truth remarked that, gifted with a wonderful self-control, his forbearance and tact secured for him much influence, which he always exercised for the benefit of others.

An editorial appreciation will be found on an earlier page of this number of the "Journal."

TWO APPRECIATIONS.

By Edwin Upton.

The Liverpool Gas Offices have assumed that muffled silence which portends sympathetic reverence where death has removed a personality of outstanding worth.

The passing of Edward Allen has brought with it sudden—

yea, and universal—loss; for does not the entire gas world suffer in the removal of an able leader, and the Institution by the deprivation of a talented colleague; while the public will no longer enjoy the services of one whose integrity, professional ability, and capacity for business rendered him practically indispensable? Only his family circle can realize to the full the great void his passing has created—because in business life the things of to-day change on the morrow—but to those mourning his loss there will come a comfort from the knowledge that, though dead, he lives in the hearts of all who knew him.

Edward Allen was endowed with great gifts, and possessed an active and winsome personality, as the writer can abundantly testify—having enjoyed the privilege of close association with him. Never was he known to utter an unkind expression; but, on the contrary, he had cultivated a genius for pleasing others, and in this lay his greatest reward. Endowed with wonderful self-control, forbearance, and tact, and aided by his high sense of honour, he readily secured great influence; but this he invariably consecrated to the good of others. Those who knew him are best able to appreciate his good works, which were distributed with a quiet, unostentatious grace. Of strongly democratic ideas, his sympathy was always given to the weakest side; and to remonstrate with him for unselfish generosity, only produced that irresistible smile by which one knew that the matter was closed, and further argument futile. For with him friendship pledged by hand endured for all time. In conversation, he made the seemingly complex simple. His active brain intuitively grasped the points, almost before they were given to him; and difficulties disappeared as if by the magic of his touch.

It is not given to a large number of men to enjoy the unbounded confidence with which he was honoured; and only a month since he had the satisfaction of hearing his Directors say, in regard to his fifty years of service: "It is not enough." His life will not be measured by the years he served, or by the time he lived, but by good deeds done; and it recalls some familiar lines by Robert Louis Stevenson—

> "Give us to go blithely on our business all this day, bring us to our resting beds weary and content and undishonoured, and grant us in the end the gift of sleep."

By R. E. Gibson.

To those who have been brought into constant and intimate contact with Mr. Edward Allen, his passing away is a great and irreparable loss. Mr. Allen was a man of outstanding personality and influence, and at once commanded the respect and esteem of those who had business relations with him. To know Mr. Allen well was to love him. His patience, his forbearance, his kind-heartedness were qualities which endeared him not only to the members of his staff but to all who knew him closely; while his energy, enthusiasm, and optimism were always an inspiration to others.

In engineering matters, Mr. Allen was most decidedly progressive. He would often go to a great amount of trouble to find out the value of new ideas. The works of the Liverpool Gas Company contain abundant evidences of his wise foresight and his great ability as an engineer.

In business affairs, his alert mind and quick grasp of facts enabled him to get through a great amount of work expeditiously and with ease.

Mr. Allen had remarkable tact in dealing with men; and, while always willing to benefit and assist the employees, he was ever true to the best interests of the Company whom he served so well and so long.

His assiduity in the performance of the new duties imposed upon him in connection with the High Explosives Committee were characteristic of his whole life. Mr. Allen had high ideals, and his patriotism was shown in the duties which came upon him in these later months, and which, in the opinion of many of his friends, involved the breakdown that terminated in his death.

His kind and genial presence will be sadly missed by a host of friends, and particularly by those who came in daily contact with him.

THE FUNERAL.

The interment took place on Saturday, at Flaybrick Hill Cemetery, Birkenhead; the first part of the service being held in St. John's Wesleyan Chapel, Belvidere Road, Prince's Park, Liverpool. The funeral was very largely attended; and those present included many friends of Mr. Allen connected with the gas profession. The Liverpool Gas Company were represented by Mr. H. Wade Deacon, J.P. (Chairman), Mr. J. E. Tinne (Deputy-Chairman), and several of the other Directors, Mr. Edwin Upton (Treasurer), Mr. Theodore Garnett, M.A. (Secretary), Mr. R. E. Gibson (Assistant-Engineer), and a great number of employees from the different works and departments. The Institution of Gas Engineers, by Mr. John Young, of Hull (President), Mr. Samuel Glover, of St. Helens (Vice-President), and Mr. John Bond, of Southport (ex-President). The Manchester District Institution of Gas Engineers, by Mr. J. G. Newbigging, of Manchester (President), Mr. G. S. Frith, of Runcorn (Hon. Secretary), Mr. W. Whatmough (Heywood), Mr. T. B. Ball (Rochdale), Mr. J. W. Allin (Chorley), Mr. J. H. Crowther (Wallasey), Mr. Samuel Tagg (Preston), Mr. Tim Duxbury (Oldham), Mr. W. T. Duxbury (Atherton), Mr. F. Betley (Wigan), Mr. H. Hoy (Tyldesley), Mr. J. H. Davies (Oswaldtwistle), Mr. F. Sidwell (Winsford), Mr. J. A. Brentnall (Northwich), Mr. W. E. Roberts (Woolton, near Liverpool), Mr. R. G. Shadbolt (Grantham). The Society of British Gas Industries, by Mr. H. M. Thornton (Vice-Chairman), in the unavoidable absence of the Chairman (Alderman F. Templer Depree, J.P.), and Mr. F. J. West. The Lancashire Commercial Section, by Mr. S. Meunier, of Stockport (Chairman), and Mr. S. E. Halliwell, of Littleborough (Hon. Secretary). The Manchester and District Junior Gas Association, by Mr. Samuel Carter, of Garston (President), and Mr. John Robinson, of Altrincham (Hon. Treasurer). The Liverpool Engineering Society, by Mr. E. C. Given (President), and other officers. The Leeds University, by Mr. Hodsman; and the Liverpool University, by Professor W. H. Watkinson. Among other gas engineers who attended were Mr. William King (late Engineer of the Liverpool Gas Company), Mr. J. Fergusson Bell (Derby), Councillor Duxbury (Darwen), Mr. John Robinson (Manchester), Mr. T. O. Paterson (Birkenhead), Mr. R. H. Brown (Birkenhead), Mr. Evan T. Davies (Oswestry), Mr. A. G. Smith (Lighting Engineer, Liverpool), and Mr. Arthur G. Readdy (Hoylake and West Kirby Gas and Water Company).

In forwarding the names of the members of the Manchester District Institution who were present, Mr. G. S. Frith says: "The gas industry has lost an able and most enthusiastic supporter. Mr. Allen was liked and loved by all who knew him; and personally I shall always look back with pleasure on the days he spent on his visits to Runcorn—having been a lifelong friend of my father."

Melancholy interest attaches to the fact that this is the third death which has occurred during the present year among long-service officials of the Liverpool Gas Company; Mr. J. F. Robinson (who retired from the Treasurership in 1910, after 37 years' service) and Mr. P. F. Garnett (who was Secretary for 45 years) having died in February. With Mr. Allen's 50 years, the length of service of these three officers aggregates no less than 132 years.

THE MARKET VALUE OF LIGHT OILS AND OTHER CONSTITUENTS OF TAR.

By Chariot and Urbain.

The finances of gas undertakings can be considerably augmented by adopting a process for extracting from gas into the tar a large percentage more of light oils in the process of gas manufacture than are usually contained in the crude tar.

The attention of the gas industry has been directed to this important subject by a very eminent engineer and expert in gas matters, who controls a large gas company in the South of London; and through whose pioneering instinct the process and its value has been made known to the gas industry. As the process opens-up a great number of collateral benefits, the industry at large owes to him its gratitude.

The best way to compare the benefit of this process, is to at once publish herewith, side by side, schedules showing from Durham coal, carbonized in horizontal retorts, the constituents and value of crude tar, and the constituents and value of tar produced, after it has washed the gas in properly designed plant, with the gas and tar at suitable temperatures, and other conditions for the best efficiency.

On reference to the tables [p. 121], it must be noted that the market values, placed against each constituent, are those which will be found in a recent edition of the "Journal," under the heading of "Current Sales of Gas Products," and where these cannot be found, an estimate of their values has been made. But it is most important that the vendors of tar should obtain the precise values from a competent impartial authority. Some constituents of tar vary considerably in price from time to time, according to the law of supply and demand. As an instance, naphthalene a few years since was absolutely valueless; but at the present time it is of considerable value. Anthracene, on the other hand, a while ago was of good value; but at present it is of little value. Creosote is rising in value.

It must be noted that Yorkshire or other coals will vary the composition of the crude and the treated tars, as will also the method of carbonization. In order to obtain the percentages of each market product, it is advisable to employ a competent practical consulting chemist who is thoroughly acquainted with the distillation of tar, and who has at his command a suitable plant, capable of distilling an agreed quantity, in order that this may constitute a practical test, and not be open to the accusation that it is only a laboratory test on a small quantity of tar. After the market value of the treated tar has been obtained, a reasonable allowance must be made to the distiller, in the case where this tar is sent entire to a tar distillery (if the gas undertaking does not possess one) for the cost of working, carriage, management, profit, &c. Gas undertakings are as necessary to tar distillers as tar distillers are necessary to gas undertakings. After the costs have been agreed with the tar distiller, the net value of the tar to the gas undertaking is thereby ascertained. The fees paid to the consulting chemist need not be costly compared with the quantity of tar sold, if samples of each consignment to the distiller are taken—one for the gas undertaking, one for the consulting chemist,

Table I.—*Crude Tar from Durham Coals per* 100 *Gallons* (*July*, 1915).

Ammonia (called 5 per cent. water)		= 3·00d.	
Benzol	0·60 gallons at 11d.	= 6 6d.	Light oils of average value 17·57d. per gallon.
Toluene	0·15 ,, ,, 3s.	= 5·4d.	
Solvent naphtha	1·00 ,, ,, 1s. 11d.	= 23 0d.	
Heavy ,,	1·65 ,, ,, 1s. 3d.	= 24·75d.	
Carbolic acid	0·6 ,, ,, 3s. 6d.	= 25·20d.	
Cresylic ,,	0·9 ,, ,, 1s. 3d.	= 13·50d.	
Naphthalene (28 lbs. at £12 per ton)		= 36·00d.	
Creosote oil	30·6 gallons at 3d.	= 91·80d.	
Anthracene (17·9 lbs. at ¾d. per unit)		= 2·25d.	
Pitch (750 lbs. at 23s. per ton)		= 92·00d.	
100 gallons crude tar value		323·50d.	
i.e., per gallon		= 3·235d.	

From this price of 3·235d. the working expenses, carriage, profit, &c, have to be deducted.

Table II.—"*Treated*" *Tar from Durham Coal per* 100 *Gallons* (*July*, 1915).

Ammonia (called 5 per cent. water)		= 3·00d.	
Benzol	2·1 gallons at 11d.	= 23·10d.	Light oils of average value 21·01d. per gallon.
Toluene	2·1 ,, ,, 3s.	= 75·60d.	
Solvent naphtha	2·6 ,, ,, 1s. 11d.	= 59·8d.	
Heavy ,,	2·6 ,, ,, 1s. 3d.	= 39·0d.	
Carbolic acid	0·54 ,, ,, 3s. 6d.	= 22·68d.	
Cresylic ,,	0·82 ,, ,, 1s. 3d.	= 12·30d.	
Naphthalene (28 lbs. at £12 per ton)		= 36·00d.	
Creosote oil	27·75 gallons at 3d.	= 83·25d.	
Anthracene (16·7 lbs. at ¾d per unit)		= 2·10d.	
Pitch (703 lbs. at 23s. per ton)		= 86·60d.	
100 gallons of "treated" tar value		443·43d.	
i.e., per gallon		= 4·4343d.	

From this price of 4·4343d. the working expenses, carriage, profit, &c., have to be deducted.

and one by the tar distillers' representative, either as agreed at the works, or on arrival at the distillery. These samples can be collected together, over a desired period, and of such quantity, as to amount to sufficient for a practical test, for each of the three parties concerned. In the case of small undertakings, this might cover a considerable period; and an arrangement could be come to between the undertaking and the distiller whereby a reasonable amount of cash credit could be given by the distiller to the small undertaking, in order to keep their finances correct, and until such time as samples had been tested, and the financial adjustment made. In the case where only the light oils are sent to the distillery, a smaller quantity of oils than tar would be necessary for each sample for test. The above arrangement will be perfectly equitable as between the gas undertaking and the distiller, because it is entirely controlled by the current market values, and both stand to gain or lose accordingly.

Certain constituents of tar are at times, owing to unusual circumstances, such as war, not readily marketable. For instance, at the present time pitch and anthracene are difficult, and large quantities of these are accumulating at the distilleries, and may continue to do so. But there will come a time when they will be considerably enhanced in value; and the gas undertakings should share in this advantage when it comes to pass. In some quarters, pitch, however, is being mixed with coke, coal dust, &c., and used as fuel for various purposes. No doubt the use of the pitch in this way could be extended.

Another method to rid the market of pitch and anthracene would be merely to strip the tar of its light oils—the residue being sold as dehydrated tar for road purposes, at an enhanced value. The surface of the country roads this summer are (in the opinion of those who should know) sustaining some considerable damage, possibly by the lessened contributions of the Road Board to the County Councils and other Road Authorities, so that the roads are not being sprayed to the extent they were last year. This is not for the want of the necessary labour, because, in many of the counties, numbers of men over the military age can be seen trimming up the footpaths, merely, it would seem, in order to give them employment. This labour would be ample for the tar-spraying of the roads. It should be the endeavour, therefore, of the gas undertakings and the distillers to urge upon the Road Board to make the necessary grants at once, so that the work can be carried out in suitable weather this season.

Hints as to the Process of Extraction of Light Oils.

Great stress must be laid upon the important part the temperature of the gas and tar play, at the time of contact in the extractor.

It has been ascertained that at 60° Fahr. the temperature of gas at the outlet of the extractor and efficient contact, the light oils down to heavy naphtha are greatly increased in amount. It remains to be ascertained to what degree the temperatures can be reduced, to obtain the best financial value from the gas and tar, and to what extent the composition of the gas is interfered with, in regard to its suitability for the consumers, as no doubt, from a financial point of view, it is better to recover from the gas its valuable constituents in a liquid form and sell the waste products in a gaseous form, with a corresponding reasonable reduction in the price of gas. In future, on this account, controlling public bodies should work more in harmony with the gas undertakings than hamper them, as they have done in the past. There is no information at present available as to what low degree of temperature all the benzene can be extracted by tar-washing; but it is known that practically all the toluene is being extracted at 60° Fahr. with good contact.

The proportions of naphthas, &c., are also increased in the tar; and it remains to determine in the future to what extent it is advisable to extract the latter. The best form of plant for the extraction of these light oils appears to be a tower-scrubber filled with wood grids of good open square mesh, arranged on the hit-and-miss principle—so presenting a large surface area covered with tar to the gas; and thus the tar circulated by a pump in its descent in the scrubber offers to the gas an excellent means for the extraction of the light oils. Moreover, no back-pressure is created by the passage of the gas, as is the case with the Livesey and rotary types of washer and many other types of washing apparatus. Where a Livesey washer is used, it is necessary, in order to obtain the maximum amount of contact, to make such arrangements that the tar must of necessity flow completely across the washer, entering at the bottom and overflowing at the top.

In some gas-works, the tar entering has been split into several streams, and has been caused to overflow on the opposite side down several branch pipes arranged at the same level leading into one pipe or overflowing a weir placed across the washer. It is necessary to have a froth of 6 inches depth or more, to obtain the best results. Little if any froth will appear on top of the tar, if any visible liquor is present—in fact, in any form of extracting apparatus, visible liquor must be rigidly excluded. Naphthalene is completely extracted from the gas when efficient washing takes place. Not only is this of great advantage to all gas undertakings, but naphthalene is a valuable product at the present time. Any measures taken to cool the gas for efficient light oil extraction have the advantage of making the ammonia plant more efficient for its size, and therefore in most instances allowing a portion of the plant to be used for light oil extraction without expenditure of further capital.

During warm weather, a ready means is usually at command at most works, in the form of water, to cool the gas and tar. Where the means at present adopted for this are not efficient to obtain the desired temperature, all exposed mains leading to the extractor can be sprayed by fine water-jets from as cool a supply of water as can be obtained. Little water need be used, as the process of evaporation very materially aids the reduction of the temperature; and, if necessary, even the extractor itself can be sprayed by this means. An easy method is to run compo. pipe along the top of the gas and tar mains; the compo. piping being pierced at frequent intervals, so as to allow small jets of cold water to fall on the pipes.

Another means of reducing the temperature of the tar is to put together with ordinary gas piping (using elbows, bends, &c.), a square or flat coil of not less than 2-inch pipe and even up to 4-inch. This coil can be immersed in a sealed water-tank. Cool water must flow in at the bottom; and the effluent water can be conducted away to the retort-house for coke-quenching or other purposes, so as to avoid waste. The tar should be run in from the top and out at the bottom, and as quickly as possible into the tar-washing apparatus.

Old hop sacking (which is cheap and convenient), if wrapped round the pipes and the extractor itself, and kept moist, is also a good method of reducing the temperature.

For the control of the temperatures, it is necessary to have thermometers fitted into the inlet and outlet gas-pipes of the extractor, and also in the inlet tar-pipe, as if the temperature of the gas on the outlet gas-pipe is not at the desired temperature, it can easily be ascertained whether the inlet gas or tar is at fault.

The quantity of crude tar to be used should be in the proportion of at least the amount of tar made per day to wash the amount of gas made per day; but where there is a large stock of crude tar, it is of decided advantage to use a greater proportion of tar.

According to the "Iron and Coal Trades Review," the Ohio Railroad has experimented with coke-breeze, and found it satisfactory when used in connection with the stoking-devices installed on a number of locomotives. Coke-breeze, it is said, makes a satisfactory fuel for locomotives only when burned in engines equipped with stokers; and forced draught is necessary to get good results. It compares favourably with the low-grade coals sometimes used as locomotive fuel.

Messrs. Thomas Glover and Co., Limited, and Messrs. R. & A. Main, Limited, are working at high pressure on large Government contracts. A large number of the staff—including Mr. W. R. Glover and Mr. R. B. G. Glover—are serving with the Colours; and, in order to assist in the management of the works and expedite the carrying out of these contracts, Mr. Charles G. Clark, their Midland representative, has been temporarily appointed Assistant Works Manager. Before his appointment as Midland representative, Mr. Clark held, for a number of years, a responsible position in the engineering department of the firm, and this experience will be invaluable to him in rendering assistance in carrying out the requirements of the Government. In the meantime, Mr. William Batt will look after the firm's interests in the Midlands until circumstances permit of Mr. Clark's return.

ELECTRICITY SUPPLY MEMORANDA.

The new small unit lamps of the so-called "half-watt" class continue to furnish our electrical contemporaries with material for presentation to their readers. The question of the birthplace of the new comers has occurred to some people; and contrasting the statements made on the subject, inquirers are left in as much perplexity as they were before in regard to it. Having mentioned that the smaller sizes of these half-watts are argon-filled, the "Electrical Times" says they are made in this country—the "Osram-Atmos" at Hammersmith, the "Mazda" at Coventry, the "Wotan" at Dalston, and the "Ediswan" at Ponders' End. That is one statement. The "Electrician" remarks: "We gather from the literature which is being circulated on the subject that the new types of lamps are made in Holland, and are licensed for sale in Great Britain. They are imported under a British consular certificate that the lamps are of Dutch manufacture throughout." It is not for us to reconcile these two statements; this must be done by those concerned in putting the lamps on the British market. It was acknowledged at the beginning of the war by the General Electric Company that a large part of the capital of their lamp works at Hammersmith was German owned, but that this was due to the conditions associated with the acquisition and working of the patents in England. This raises the question as to whether the works in Holland which are turning out these small unit "half-watt" lamps of "Dutch manufacture throughout" are, in whole or in part, financed by German capital, or whether the "Dutch" works are paying anything in the shape of royalty to any German Company, so causing British buyers of the "Dutch" wares to indirectly trade with the enemy. The suggestion only occurs to us; we have no positive knowledge on the subject. But the matter is one of interest, and might be worth inquiry, as there is (or there ought to be) a deeply rooted feeling in the British electricity supply industry that it was high time it did something to effectually stop any resumption of its partial financing of Germany—directly or indirectly. We know that factories of various kinds have been set up in certain neutral countries by German capital; so making these neutral countries a shielding curtain for a little German export trade. Is this also the case with these small unit "half-watt" lamps? Or are they really produced on Dutch soil, by Dutch capital, without a penny piece of the profits going to Germany? If so, we compliment the Dutch manufacturers on their success in forestalling the Germans in producing the small unit "half-watt" lamps. It is, however, a case in which doubts are pardonable.

Holland and the Small Unit "Half-Watts."

We have been favoured with a copy of the "Lighting Journal and Engineer," which, we learn, is conducted by Mr. A. J. Greenly. It is described as being the "leading journal of the industry devoted to improvements in the application of electricity to lighting, heating, cooking, and ventilation." Having scanned the contents, we are of opinion that certain of the other electrical papers need not trouble to dispute the claim. There are other electrical papers that profess to be "oldest" among the electricals in some feature or other; but not one of them, so far as we have seen, arrogates to itself a supremacy in any other particular. Speaking of age, our own "Journal" heads them all; for, to the best of our knowledge, it is the oldest technical and trade paper in existence, and of its great progeny, only the electrical papers occasionally refer to it in terms of disrespect. We suppose these intermittent lapses on their part are due to the fact that, with age and increasing responsibilities, the "Journal" has advanced in activity and usefulness to the industry which it has served for some 67 years. However, this by the way. Although the Greenly conducted paper is the "leading journal" in the electrical industry, a boldly printed statement informs us that, owing to the war, it has been decided to publish fewer and more "representative" issues; and the scope has been extended to embrace heating, cooking, and ventilation—articles by "representative" authorities being included in the number before us. This reduction of issues does not speak of a golden prosperity.

The "Leading" Electrical Journal.

However, glancing at the contents of the "Lighting Journal," it is noted that the policy of electric undertakings increasing the price of electricity has been "dictated by stern necessity;" and "there is no doubt that it will be reversed as soon as normal times again prevail." What we have in the past known as "normal times" are not, we are afraid, going to return with any alacrity. Speaking of the Point-Five system, the "leading" electrical journal says: "The system is favourable by comparison with the average prices of gas which prevail up and down the country." On what ground is this statement made? It "*must* be so," says the concentrated wisdom of our contemporary, "otherwise the public would not be attracted to it." It is really not sufficient evidence of electricity, through the system, holding a superior position to gas in the matter of cost. There is no definite information in the article as to the extent to which the public has been attracted by it; while the Board of Trade statistics relating to the gas industry do show that its sides are continually bulking more and more through increasing numbers of consumers, and the growth of the consumption of gas. But we are not allowed by the "leading journal" to enjoy precedence in any way; for where the charges favour gas, it says, then "there is money value attaching to the cleanliness and convenience of electricity." What is there against the cleanliness, convenience, and thermal value of gas? We will refrain on this occasion from making a few comparisons that are not very acceptable to our electrical friends. However, we proceed to learn that the "Point-Fives" will in time absorb or convert all their rivals. They seem to be a long time about the job; and the resistance to conversion was rather strongly marked at the recent meeting of the Incorporated Municipal Electrical Association. [See "Memoranda" for June 29.] Another editorial is evidently suggested by an article by Mr. F. J. Barter Collis, on "Electric Lighting and Cooking on Trains." The editor of the "leading journal" says that "the evidence of Hawes, Aisgill, and Gretna fires is proof positive of the dangers of gas." Where is that "proof positive?" The editor had better seek advice upon the point from the "Electrical Review," which will tell him of its sorrowful experiences through prejudging matters, and through knowing nothing, or professing to know nothing, of the behaviour of gas under pressure when allowed unregulated escape. There is an article by Mr. John F. Shipley on "Industrial Electric Heating," one by Mr. W. A. Gillott on "Electric Cooking," and another on Electric Heating and Cooking by Mr. S. M. Hills—a gentleman who has maintained a discreet silence regarding the criticisms [in the "Memoranda" for April 20] of his paper before the Junior Institution of Engineers. Mr. A. H. Seabrook gives a brief "Survey of the Rise and Progress of the Point-Fives Association," which progress is only marked by twenty-three towns having a tariff somewhere in which 0·5d. is mentioned, which in all but one or two cases is not the average charge per unit for heating and cooking.

Contents.

Regarding the article by Mr. J. F. Shipley on "Industrial Applications of Electric Heating," this is the gentlemen who recently had a nasty fall through stating, at a meeting of the Junior Institution of Engineers, that there had been some dreadful experiences through the use of gas in a straw-hat factory at Luton. It turned out that Luton was not the town; and that the experience was one dating back some time. [See "Journal" June 1, p. 502, and June 8, p. 594.] We invited Mr. Shipley to say where the factory to which he referred was really situated; but there has been dead-silence—discretion now being with Mr. Shipley in such a matter as this the better part of valour. Now he says: "The writer himself has observed the signs indicating partial poisoning from fumes arising from gas-burners used in industrial heating-irons." The girls "complained of sickness, and their cheeks were pale and puffy; and their work was done only listlessly. Obviously the air the girls were breathing was too hot, with too much carbonic acid, and *perhaps* a touch of carbon monoxide as well." We again invite Mr. Shipley to state where this factory is situated in which the puffy faced girls worked, and to send us a proper chemical analysis of the air which showed too much carbonic acid in it, and "perhaps a touch of carbon monoxide." Does Mr. Shipley think it manly to make a suggestion with the indefiniteness of a "perhaps" in it as to the presence of a poisonous gas, which he obviously wishes to be understood he attributes to the combustion of gas? Apparently he does not know that the factory inspectors see to it that the ancient and absurd prescription of the Factory Acts is observed—that the carbonic acid in the atmosphere shall not exceed 12 parts in 10,000 parts of air during daylight, and 20 parts in 10,000 during the hours of artificial lighting. In aërated water factories the men work in atmospheres containing as much as 300 parts in 10,000. In breweries the men tending the fermentation vats work for long periods in concentrations of carbonic acid of 0·5 to 1·5 per cent. These men have not pale and not in all cases puffy faces. Mr. Shipley should study modern scientific authorities on the subject, and he would find good cause for not setting his views in opposition to theirs. Men have been kept for experimental purposes in atmospheres containing 3 to 4 per cent. of carbonic acid (300 to 400 parts in 10,000) without being aware of the fact. We advise Mr. Shipley to begin educating himself on a subject of which he manifestly knows little or nothing by reading the article from the "Lancet" which appeared in our issue for July 6 (p. 39). He has, of course, never heard of thousands of factories in which heating in the manufacturing processes is by gas, and neither workers nor manufacturers would be without it. There is no trouble in these places; then why should there be in other factories?

Want of Knowledge on the CO_2 Question.

From the article by Mr. F. J. Barter Collis on "Electric Lighting and Cooking on Steam Hauled Trains," it is plain that there are electrical men who understand the problems and the difficulties governing the free application of electricity to lighting and cooking on trains who (though naturally they have a bias) are not so hysterically in favour as certain people who are less competent to judge, and whose painful shriekings over it are such as to excite pity. It is only to be expected that an electrician capable of rational talk, and yet at the same time desirous of putting forward the best possible concerning his own particular commodity, would say, as Mr. Collis does, that

Train Lighting and Cooking Difficulties.

electricity as it is generally installed on trains (24 volts) is safe, odourless, cool, and easily controlled. Having said this, he is obliged to acknowledge that it is not low-priced. The capital expenditure is "fairly heavy;" the dead-weight haulage is an appreciable factor; and the over-all efficiency—reckoned from the locomotive through the intervening dynamo and drive, the regulating apparatus (if any), and the battery or batteries—is not high. The cost of maintenance, even upon a comparatively high-priced installation, is probably not less than 10 per cent. per annum on first cost, and may be more if all charges are taken into consideration. From the point of view of economy, electricity makes a very poor showing. As to cooking by electricity, Mr. Collis has to admit—it being an obstinate fact—the low thermal value of electricity in relation to gas, which puts upon the current a heavy disadvantage when entering into the competitive field. There are also practical difficulties connected with the provision of the necessary generating, storage, and cooking apparatus. The lighting load of a main railway coach may be taken as from 15 to 17 amperes (say, 400 watts). This necessitates the employment of a dynamo having an output of about 25 amperes at 24 to 36 volts—say, an average of 750 watts—while the capacity of the battery installed may be such as to sustain the full lighting load for six hours. Suitable controlling or regulating gear will also be needed. Mr. Collis estimates the power requirements for cooking a full-course dinner for a large number of passengers at 1 kilowatt-hour per head. From this it will be appreciated that the size and cost of components capable of providing the necessary current for cooking would be large, and, further, that since the conversion efficiency of mechanical power into current is low, the additional tractive effort imposed on the locomotive might be so serious as to be even prohibitive. Yet Mr. Collis says "there is an immediate demand, *whatever it is worth*, for safety first, and the total suppression of gas." He does not say whether he joins in the demand. The italicized words suggest that he does not. He knows full well the large amount of hypothesis and imagination that has been forced into this discussion by loud-mouthed electricians, who harbour the view that gas released from cylinders at high pressure lingers round about the wreckage of a train in order to help in the conflagration, and considerately provide a case for electricity. But the same persons conveniently forget to agitate for the abolition of incandescent fuel under the locomotive boilers, of the use of combustible wood in the construction of the coaches, and of the employment of lubricating oil upon them, all which contribute to conflagration. They overlook, too, the heavy toll of life through electrical operation in industries and mines.

Electric Cooking Data.

Some interesting data on the subject of electric cooking appear in the article by Mr. W. A. Gillott, of the Newcastle Electric Supply Company, Limited; but the value of the data is diminished by the ever-missing factor in contributions of the kind—the amount of work done. The author puts the quantity of electricity consumed for cooking in a household of six persons at an average of 35 to 40 units per week; but as this includes the baking of bread electrically, we venture to think the figures should be placed on the minimum line. Employing coal for water-heating and warming the kitchen, and (when required for these purposes) boiling vegetables, soups, &c., Mr. Gillott found that, in 1913, the consumption of electricity in his house worked out to 4629 units—divided as follows: Heating, 2130 units, cooking 2129 units, lighting 370 units. The house has six rooms, kitchen, &c., with an electric-cooker, two kettles, iron, shaving-pot, and three radiators, with a total load of 15 KW. There were four adults and two boys in family. The total cost for lighting and heating worked out as follows:

Fixed charge	£3	0	0
4629 units at ¾d.	14	9	4
	£17	9	4
Less 5 per cent. discount . .	0	17	6
	£16	11	10
4 tons of coal	4	0	6
Total	£20	12	4

During the year ending March, 1915, in a different district, Mr. Gillott used for electric cooking and heating only 3270 units. The coal consumed was the same; but the total load of the electric apparatus in this instance was only 11 KW. There was also one adult less to cater for. In regard to the total of £20 12s. 4d. in the foregoing table, it may be said that in the larger house of the writer of the "Memoranda" the account would be deemed high, yet the use of gas (at 2s. 2d. per 1000 cubic feet) is not stinted. The fixed charge, too, of £3 is low; and although the units are charged at ¾d. per unit, instead of ½d., the average cost (including the fixed charge) for lighting, heating, and cooking is only 0·905d. per unit. How many electric undertakings could afford to do all their domestic business on a flat-rate for every purpose of 0·905d. per unit, which figure would further diminish as the number of units consumed increased? This is not the price that all the company's business is done at, nor is it the price which produces the bulk of the profit for the shareholders.

Wicked Thoughts.

Our dear friend, the "Electrical Review," has some wicked thoughts—so wicked that it admits they will not bear publication. It is an admission of moral degeneracy. The wicked thoughts arose over the upshot of a decision by the Finchley Borough Council to adopt electricity for lighting some workmen's dwellings. Tenders were invited for the installation work on the first hundred houses. The lowest of 29 tenders was £686 or £720 for alternative systems, in addition to which there was the Electricity Department's service charge of £19. By dividing the lowest tenders by 100, our contemporary arrives at the fact that the lowest-tendered price means between £7 and £7 10s. per house, entailing for a fifteen years' loan annual repayments of about 13s. per house. Would those responsible for our contemporary care to live in a house wired for less than that amount? We trow not. On the other side, the local gas company offered to lay the connections and carcass all the first 100 houses *free of charge*, in the event of the Council deciding to install gas there; but with the condition that, if the Council supply electricity to any of the dwellings within five years, they shall pay to the Gas Company 10s. for each house so lighted. The responsible Committee made a close scrutiny of the position, and put the free gas piping alongside the £7 to £7 10s. for electric wiring; and then they looked at the 10s. penalty to be paid to the Gas Company in the event of the Council changing their minds, and preferring waste to economy. The conclusions arrived at were that the Gas Company's offer was indisputably cheaper than the lowest electrical offer, that it relieved the Council of all financial obligation, and that the Committee had no option but to decide in favour of gas. The "Electrical Review" says its last information goes to show that the Council have been considering the report of the Committee *in camera*. Then follows the confession of degeneracy: "Some thoughts will not bear publication." We are surprised.

BRITISH DYESTUFFS.

It was announced in the Daily Press last Tuesday that British Dyes, Limited, had already established a research department, with Dr. G. T. Morgan, F.R.S., F.I.C., at its head, and had appointed a Technical Committee, consisting of him and three colleagues, of whom Dr. M. O. Forster, F.R.S., F.I.C., had been nominated Chairman of the Committee. One member of the Technical Committee has, we believe, had considerable experience in the laboratory of a firm who have manufactured coal-tar dyes for many years past; and if the Company are able to secure nearly the whole-time services of their Technical Committee, and give them a considerable number of qualified chemists as assistants in research work, we are glad to think that the research department of British Dyes, Limited, should shortly prove of as great value to the Company as the corresponding departments of the great German dye-producing firms have proved to them. We cordially wish Dr. Morgan and his colleagues all success in the work they have undertaken. The results will have a far-reaching influence in deciding the question of establishing research laboratories by the Boards of many other of the industrial undertakings in Great Britain.

British Dyes, Limited, have also resolved to appoint an Advisory Council, under the chairmanship of Professor Meldola, D.Sc., F.R.S., F.I.C., and have invited thirteen professors to join him and the members of the Technical Committee as members of the Council. It appears to us that an Advisory Council of eighteen members is unwieldy, and there is far too great a preponderance on it of the academical branch of the chemical profession. We hope, for the success of the work of the Council, that professors who have merely been invited to join it because they hold the premier chairs in our principal universities and colleges will decline the invitation, unless, like the Chairman, and Professor A. G. Green, M.Sc., F.R.S., F.I.C., Professor W. H. Perkin, Sc.D., F.R.S., F.I.C., and one or two others, they have special practical knowledge of coal-tar colours. The reduction in numbers which we trust will thus be effected would admit of the appointment to the Council of one or two men who have made a special study of the subject, but whose life work has not necessarily trended in the direction of academical chairs and Fellowship of the Royal Society. A less unwieldy and more utilitarian Advisory Council would thus be secured to the lasting benefit, we fully believe, of British Dyes, Limited.

The development of the synthetic dye industry in this country should undoubtedly create a demand for text-books dealing with this branch of chemical technology, if only for the guidance of students who contemplate passing into the laboratories of synthetic dye works. It is true that the existing treatises and dictionaries of organic chemistry, technical journals, and patent literature contain all the information on the subject which the author of a text-book would feel at liberty to publish, even though he had inside knowledge of the industry; but this information is scattered, and the student may reasonably expect to find it extracted and co-ordinated in a single manual. We have before us a small volume, to which the names of four authors are attached, which comprises extracts, with additions, from a more comprehensive treatise on industrial chemistry, brought together with the object of furnishing a manual on "Dye-Stuffs and Coal-Tar

Products."* The aim is a good one; and we do not doubt that the appearance of this book will stimulate other authors and publishers to efforts in the same direction.

The four authors do not appear to have collaborated in all sections of the volume, since three of the eight chapters afford evidence of individual—though undeclared—authorship. There is great difference in the merit of these chapters; and it seems a pity that credit cannot be allotted where credit is due. On the other hand, we are not surprised that the writer of an appendix on the "Preparation of Organic Compounds by Electrical Processes" preferred to sink his individuality in a tetrad.

The first chapter of the book gives a brief sketch of the "Industry of Coal Tar and Coal-Tar Products," including some statistics of production, import, and export of some of the more important products. We regret to see that the distinction, which is perfectly clear in English, between benzol and benzene, toluol and toluene, &c., has not been observed by the authors, who have evidently been led into confusion by the common German usage of the words benzol, toluol, &c. Incidentally, we may observe that the specific gravity given for benzene—viz., ·839—is so much in error that hardly any reader will be misled by it. We do not know what grounds the authors can have for the statement that coal-tar pitch is used "to a certain extent for paving streets, &c.—the natural asphalt being, however, both cheaper and better for the latter purpose." If this be true, why do road authorities use more and more pitch each succeeding year?

The second chapter, on "Industry of the Synthetic Colouring Matters," is the longest, and perhaps the most useful, chapter in the book. It gives references to the principal authorities on the subject, and also to patent literature. In regard to patents, however, it must be borne in mind that many specifications relating to synthetic dyes have been drafted with a view to misleading potential competitors rather than for securing direct protection for the inventions which they purport to disclose. In order to combat this evil, it would appear reasonable to require patentees, in return for the protection which they obtain for any real invention, to refrain from patenting spurious processes, under penalty of forfeiture of whatever patent rights they hold.

The third chapter is a very brief one, on "The Industry of Natural Dye-Stuffs," and, like several other chapters, exasperatingly often refers the reader, for the very information he would reasonably expect to find in it, to other parts of the larger work from which this manual is extracted.

The next chapter gives an outline of the dyeing and colour printing industry, on which there are, of course, several standard handbooks in the English language. Nevertheless, it is appropriate that a chapter such as this should form an adjunct to a manual dealing primarily with the synthetic dyes themselves.

"Inks," the subject of the brief fifth chapter, has also been dealt with in standard English handbooks.

One page dealing with "Saccharine and Other Artificial Sweetening Chemicals" is dignified with the heading Chapter VI.

The seventh chapter relates to "The Industry of Modern Synthetic Drugs," which may be regarded as being an offshoot of the synthetic colour industry, since it has developed in conjunction with the latter, and is more or less dependent on it for some important raw materials. It appears to be solely the work of one of the four authors, and, though brief, is one of the best chapters in the manual.

The eighth (and last) chapter, on the "Industry of Photographic Chemicals," also appears to be solely the work of one of the four authors.

The manual covers ground which is not, to our knowledge, covered by any single manual previously published in the English language; and on this account it should find a goodly circle of readers.

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* "Dyestuffs and Coal-Tar Products, Their Chemistry, Manufacture, and Application, including Chapters on Modern Inks, Photographic Chemicals, Synthetic Drugs, Sweetening Chemicals, and Other Products derived from Coal Tar." By Thomas Beacall, B.A. (Cambridge); F. Challenger, Ph.D., B.Sc.; Geoffrey Martin, Ph.D., M.Sc., B.Sc.; and Henry J. S. Sand, D.Sc., Ph.D. [Reprinted, with Additions, from "Industrial and Manufacturing Chemistry," Vol. I.] London: Crosby Lockwood and Son; 1915.

TWENTY-FIVE PER CENT. STANDARD SULPHATE.

An Argument in Favour.

There are makers of sulphate of ammonia who still hold back from the production of 25 per cent. sulphate of ammonia, and who, in defence of their customary practice, advance all manner of argument for the retention of the 24 or 24½ per cent. quality. It is all a question of the correct policy. They think their policy is right; many others who have extensive experience as makers and sellers, and some of whom are directing the work of the Sulphate of Ammonia Association, think otherwise, realizing well that a new standard of requirement has been created—the 25 per cent. standard—which must now and in future be complied with. Individual opinions in a matter of this kind are based on various grounds. Cost of manufacture and other questions arise. But the ultimate ground for decision is furnished by the buyer of the produce. If his requirements are not satisfied by one producer, they will be by another; and the one who does not give what is needed must eventually go to the wall.

The Sulphate of Ammonia Association have had difficulty (and in cases they have not yet been successful) in converting some makers from their old ways to the new—from the production of the lower quality material to the necessary higher quality. They have now issued a pamphlet which all producers should read, and which is convincing as to the complete dominancy of quality to-day in the sulphate of ammonia markets of the world. The pamphlet is practical in its argument. The consumer's point of view—which is the chief one—is first presented. Some makers agree that, for the export trade and competition abroad, a 25 per cent. quality is requisite; but for the home trade the lower quality sulphate can be supplied with advantage. But is the British farmer so short of intelligence that he will continue to be satisfied with a quality less than that which his equals abroad consider necessary, and find the best? We think not. The pamphlet supplies illustration as to the effect of experience. A southern British farmer last year could not get a supply from the local gas-works of the 24½ per cent. sulphate of ammonia to which he had been accustomed, and so he purchased a guaranteed 25 per cent. sulphate from a neighbouring gas-works. The following year he placed his order again with the makers of the 24½ per cent. quality. Delivery was followed by complaint. The farmer said that last year he had had no difficulty in applying the sulphate with his drills, whereas this year the salt was moist, clogged the drills, and the lumps had to be broken up before the material could be applied, which involved a considerable amount of labour. He therefore insisted on having the same quality as last year. The moral of this is clear. Experience will assert itself at home, and gradually, as it has done abroad, reduce the limits of the field within which there can be disposal of the 24 and 24½ per cent. sulphate. America compels a 25 per cent. quality; Spain is not so particular, because the consumers buy on delivered weight. The experience, however, of merchants shows that it pays to send 25 per cent. sulphate of ammonia even to Spain, owing to the large saving in loss of weight. The Sulphate of Ammonia Association are convinced that, if makers had sold direct to Spain on delivered weight, they would long ago have adopted a higher standard in self-defence; for losses in weight on the 24 and 24½ per cent. shipments, often amount to 2 or 3 per cent., sometimes more.

Special attention is drawn in the pamphlet to the necessity of sending out sulphate of ammonia in good mechanical condition. As a rule, good makes testing 25 per cent. ammonia or more, and containing about 2 per cent. moisture and ¼ per cent. free acid, are in a fine granular state ready for immediate application to the soil. This is a selling advantage. The question of bagging is also dealt with, which brings us to the makers' point of view, and to the "battle royal" that there has been between the makers of the two qualities. Owing to the various and interacting factors that almost day by day influence prices, it is impossible to settle the controversy on the basis of relative market prices. The 24 per cent. men say that it will cost something extra to make 25 per cent. sulphate; and they do not see that there will be any gain to compensate for the additional cost. The matter is argued in the pamphlet; but the salient part of the argument, in our opinion, is where it is pointed out that the past is no criterion for the future. Just as the War Loan has set up a new standard for capital and in the Money Market, so has foreign competition with British sulphate of ammonia set up a new standard of quality. Until German and American sulphate of ammonia, guaranteed at 25 per cent., came along, it would not have paid the British manufacturers to have made a 25 per cent. quality. But this competition is a big factor; and we have the case put into a nutshell:

> The conditions in the trade have changed entirely during the last few years. The supply of 25 per cent. sulphate of ammonia has increased enormously, and with it has increased the demand for it. About *half* the world's production of sulphate is now sold on a 25 per cent. basis; and it is certain that in the near future, owing to the large increase in the German output, *a still greater proportion* of 25 per cent. will be available. Synthetic sulphate of ammonia will shortly be produced at the rate of 300,000 tons per annum, so that the output of Germany will be about 800,000 tons.

The march of the higher standard will continue; and the wordy arguments of makers will not stop it The lower qualities will have to come into line with the higher standard—sooner or later; the sooner the better for the reputation of British makes. The Association urge upon those who propose delaying the change until after the war is over, the immediate conversion of their practice from the lower to the higher quality. We read:

> The present moment is the right time to change. The sentiment of the world is overwhelmingly anti-German; and British manufacturers will undoubtedly obtain a preference if they can turn out a quality equal to German sulphate of ammonia. At the present moment, many overseas consumers who had been regular buyers of German sulphate of ammonia, and had made fresh contracts with Germany before the war, are receiving British salt instead. Only about 10 per cent. of British sulphate of ammonia tests 25 per cent., so that very many of the buyers must be making comparisons which are anything but flattering to our salt. It would give our merchants an enormous advantage over the Germans if they could go to foreign buyers now and say: "At the present momont, we are the only exporters of sulphate of ammonia; if you want sulphate, you must therefore come to us. But we are not going to sell to you now unless you give us an undertaking to give us the first refusal of all your business after the war is over. As far as quality is concerned, we can now supply you with 25 per cent. sulphate of ammonia, fully equal to, if not better than, German salt; and we can guarantee that the bulk of the British production will henceforward test 25 per cent. so that you need not be afraid about

> supplies." In this way, merchants could do much now to consolidate our position in the foreign markets. It rests with the British manufacturers to enable the merchants to take this step, by providing a large supply of 25 per cent. salt immediately.

As to the cost of making 25 per cent. quality, this must vary according to the plant employed. The pamphlet points out:

> It may be safely asserted that there are very few makers in this country who already employ centrifugal driers who could not raise their production to 25 per cent. standard at a trifling cost. In a great many cases, the extra cost merely means a little extra labour in turning over the heap of salt. The problem of making 25 per cent. resolves itself largely into well-whizzing the salt, and careful regulation of the saturator.

The Association now supply expert advice free to members; and their expert is at command for giving practical demonstrations on the spot.

Those sulphate of ammonia makers who have not yet become converted to the higher standard, should read the full cogent argument presented by the pamphlet. If it does not entirely turn opinions, we feel convinced that it will do something to undermine their stability; and this will be something to the good, as helping to the consummation devoutly hoped for of the final collapse of those opinions, and which collapse prudent thought for the future demands.

THE SOUTH SUBURBAN METER-RENT MISTAKE.

Withdrawal of the Circular.

The agitation over the meter-rent circular of the South Suburban Gas Company [*ante*, p. 69] increased last week—a ratepayers' meeting was held; local newspapers discussed the matter; the Company found the flow of inquiries was swelling. We know, too, that, though a considerable number of the agreements to pay 6s. a year instead of 3s. for meters were signed and posted, there was a by no means small number of those who appended their signatures to the circulars who afterwards wished they had not done so; the feeling growing (as it would do among outside people) that this was an instance of a large and powerful Company making an effort to—although the sum per individual consumer in the old South Suburban area only represented 3s. per annum—squeeze something more out of the consumers, supplementary to the increase in the price of gas that had been necessitated owing to the conditions imposed by the war. The Company have in consequence of the storm raised been upon the defensive; and the Secretary (Mr. Wilfrid Wastell) has been "interviewed" by a representative of one of the local papers, and has appeared as spokesman for the Company at a ratepayers' meeting.

It appears that the system of meter charge that has had application in the case of the old South Suburban Gas Company from quite distant times has been a flat-rate of 3s. a year for all sizes of meters. A flat meter-rate does not appeal to us as being fair; and it has only one other example in the neighbourhood of London, and that is at Croydon, where the flat-rate is 4s., and not 6s. as proposed in the case of the South Suburban Gas Company. If a meter-rent is justified at all (and, of course, it is), then the rent, as we held last week, should have some relation to the expenditure incurred in respect of the different sizes of meters; otherwise no real basis exists for the rent. On most other things for which payment is made by way of rent, there is graduation according to the capital and other costs associated with the article, house, or whatever else it may be. To say that the small rent charged to the man with the large meter is fair because he deserves the consideration owing to his consumption of gas being larger than that of the man with the 5-light or 10-light meter is a queer contention. Such tender regard for him suggests, to follow the argument to its logical conclusion, that the larger the meter the nearer to vanishing point the rent should be brought. Consideration in respect of gas consumption should be based upon the quantity of gas consumed, and not upon the "rent" paid for a meter. The matter of a flat or graduated meter rate would not have arisen for mention were it not that the Company point out that the flat-rate of 3s. per meter has not, and does not, pay them In respect of the old South Suburban area, contentment by the Board with the existing condition of things was long-lived. Had this not been so, the Board would have made an alteration before the fusion with the Bromley and West Kent Gas Companies. If there was loss in the old South Suburban area, it follows that it was not due to the rent paid by the smaller meter users, but to the lowness of the rent paid by users of meters of large size, and therefore more costly. While saying this, we are not at all suggesting that a condition of things should be altered now that has subsisted so long.

Having substantially raised the price of gas owing to war conditions, the Company issued the circular proposing to double the flat meter-rent—making it 6s. for all sizes of meters throughout their district. The time, it is now admitted, was not the best one for doing this. What were the inducing motives? There is the statement as to loss on the meters. But there is something else. In the West Kent and Bromley districts, graduated meter-rents are the rule; and in the West Kent area, the rents have erred on the high side. By bringing the rents down to a flat-rate of 6s. in the two areas, the consumers, taking them as a whole, benefit, and naturally are quite willing to sign the new agreement. In bringing down the meter-rents to a flat-rate in those areas, the Directors did not want to add to the Company's "losses" from this branch of revenue; and so they came to the benevolent decision to launch the burden on to the old South Suburban consumers by the simple expedient of doubling their flat-rate, which would nicely adjust matters, and give the Company a few hundreds more than they had been receiving from meter-rents before. The scheme is worthy of the ingenuity of a notable Chancellor of the Exchequer. Why should the consumers of gas in the old South Suburban area be so charitably inclined as to pay the money required for the relief of the consumers in the recently annexed areas. We do not remember that the South Suburban consumers at the time the amalgamation with the two neighbouring Companies was spoken of were told that one of the benefits that would accrue to them would be the felicity that they would derive from paying extra in order to give meter-rent relief to their new connections.

Another point that is made by the Company is that the advantage to them from the levelling up and down to a flat-rate of 6s., would only amount to about 0·1d. per 1000 cubic feet over the whole sale of gas. Compared with what? The whole condition of things, or after deducting a sum representing the "losses" under the flat-rate of 3s.? It is not a question of what the gain would be over the whole output of gas, but what it represents upon the consumption in the old South Suburban area. Three shillings extra for meter-rent in that area means that the ordinary consumer who uses 36,000 cubic feet of gas a year will pay 1d. per 1000 cubic feet more—not merely 0·1d. more, those who consume less something more, and so in proportion; while the Directors have a very sympathetic eye upon the man with the large meter who is allowed to have it at the same price as the man with the small meter. In the days before the war, there was great rejoicing on the Directors' side of the table, and the proprietors applauded, when the Chairman was able to announce a reduction in the price of gas by 1d. per 1000 cubic feet.

But further comment is not required for a single and sufficient reason; and what has been said on behalf of the Directors in defence of their action requires no further criticism for the same single and sufficient reason—

> The Directors have withdrawn the meter-rent circular; and the consumers in the South Suburban area will continue to pay 3s. per meter per annum, as they and their predecessors have long been doing.

THE NEW GAS-WORKS AT BUDAPEST.

By M. Isidor Bernauer, the Manager.

[Abstract-Translation of a Description in the "Journal für Gasbeleuchtung" for May 8, 15, 22, and 29.]

(Continued from p. 78.)

Station Meters and Governors.

The gas travels from the purifiers to the station meters in three 36-inch mains. The meters and governors are housed in a building 177 feet in length and 78 ft. 9 in. in width. Included in the building is also the plant for introducing air into the gas before purification.

There are three meters, working on parallel streams of gas, each capable of passing 212,000 cubic feet per hour. These are the first meters of so large a size on the Continent, and special care had to be given to the construction both of the casing and of the white metal drum, on account of the high water pressure and the high speed of the periphery of the drum. The meters are 19 ft. 8 in. in diameter, and the cylinder is 20 ft. 5 in. in length. The inlet and outlet connections are 36 inches in diameter. The cast-iron casing is constructed of 24 curved plates for the cylindrical part and 14 flat plates for the ends. The plates of the sides have milled flanges, with a special caulking hammered in; those of the ends have deep milled flanges, packed with red lead, and firmly held together by screws. The cylindrical casing is strengthened by the insertion between the middle flanges of a wrought-iron ring; the ends being stiffened to resist the great pressure of water by the insertion between the flanges of flat iron plates, 13¾ inches wide and 1⅜ inches thick. The whole casing is further stiffened by numerous longitudinal and transverse ribs, to enable it to withstand without distortion the pressure on all sides of the 24,200 gallons of water which it contains.

The drum is constructed of white metal, in four chambers. All the walls are strengthened by T and angle iron, and all wrought iron used in the drums is very heavily galvanized. The drum centre or cross is of cast steel, and is firmly keyed on to the steel axle. Each chamber is made accessible by a manhole corresponding with the openings in the casing. The lower part of the casing is made by plates into a sludge chamber, to which a discharge valve is fitted. At the back are the inlet and outlet connections, with bye-pass valve, all 36 inches in diameter, with water supply, King's overflow, and water level gauge. Both bearings of the axle of the drum are inside the casing, and are provided with an arrangement for lubricating them from outside. The revolutions of the drum are transmitted by toothed wheel gearing, through stuffing boxes, to the indexes on the face of the meter. The joints on the front of the meter are covered by ornamental bands; but the chief ornamentation is a griffin and a lion supporting the arms of the City of Budapest. The record of the meter can be read at any time in Arabic figures on a dead-beat recorder. The meter is also provided with a registering apparatus which prints the reading every hour on a strip of paper, which is removed every day and preserved. A clock dial in the centre of the face of the meter is coupled with the registering apparatus, and the hands are driven from transmission gearing brought to all three meters from a large outside clock; so that the records of all three meters are registered at precisely the same time.

The installation of governors comprises relief or bye-pass governors between the inlet and outlet of the gasholder, an initial governor, and the distributing governor. The principal relief governor has 40-inch connections, one of which communicates with the inlet and the other with the outlet of the gasholder. The inside of the governor bell stands under the pressure prevailing at the outlet of the gasholder, and the outside is under a constant pressure of say 16-10ths. Should the pressure at the outlet fall considerably, owing to any wrong manipulation of valves or other reason, the bell falls and thereby operates the valve, causing it to open and allow gas to pass from the inlet of the holder to the outlet main until normal conditions of pressure are restored. An auxiliary relief governor attached to the gasholder inlet is set to open when the pressure there rises above (say) 12 inches. When it opens, the gas pressure operates a valve which allows gas to pass direct from the inlet main to the outlet main of the gasholder until the pressure on the inlet side falls again to normal. These governors, therefore, serve to prevent any interruption in the supply of gas to the district, and to avoid any dangerous rise of pressure on the inlet side of the gasholder causing back-pressure on the system of works apparatus.

The initial governor has 32-inch connections, and is of the usual type, with a bell operating a throttle valve. It is loaded with weights to give the desired pressure on the outlet, and its object is to control the pressure of the gas entering the more sensitive distributing or district governor. The latter is on Müller's system, and is automatically loaded with water to control the distributing pressure within set limits. It has 32-inch connections. The automatic control depends on the flow of water through a syphon tube, which connects an annular cup on the outside of a tank with a cup on the top of the bell which floats in this tank. The bell, which is of white metal, is attached by a central spindle to the valve disc, which moves up and down the cone of the governor. In most patterns of governor loaded with water, either a continuous supply of water or a complex train of levers is necessary; whereas in the pattern here adopted only the water lost by evaporation has to be made good about once a week, and there are no levers or other train of mechanism.

The air delivery plant comprises three blowers with air-meters. The blowers are driven by engines directly coupled to them, and a safety bye-pass is provided by which air is returned from the pressure side of the blowers when too much air is being pumped. The air supply to the blowers is taken from outside the building through a main which has its mouth about 7 feet above ground level, and has a number of wire gauze screens to hold back dust. The compressed air passes out through two 6-inch pipes, with non-return valves to prevent gas passing back through them, and through two meters by which the volume is measured.

The house also contains two gauge boards, on which the pressure in different parts of the train of apparatus is shown, and a Crosley pressure recorder which indicates and registers the pressure in the distributing main. The latter pressure is also shown on an indicator, with magnified scale, attached to the distributing governor.

GASHOLDERS.

The two gasholders are each of 3,530,000 cubic feet capacity, in four lifts. In order to keep the cost of the foundations as low as possible, having regard to the soil being partly silt and partly made-up, the lower edge of the tank was put only 10 ft. 6 in. below the level of the ground, and the soil was sloped away round the holder to its angle of repose. The foundation consisted of a 10 to 13 feet layer of gravel well filled with thin clay; the top being a 4 to 10 inch slab of concrete.

The tank is the heaviest item in the cost of large gasholders according to the usual mode of construction, in which the steel cylindrical tank with flat bottom has to have side plates of great strength to resist the bending moments. Large quantities of steel are required, and the working of the thick plates is both difficult and costly. The sharp angle between the side walls and the bottom is also a source of trouble. These troubles are avoided in the bowed or bulged tank of the "M.A.N." (Augsburg-Nuremberg Engineering Works) pattern, in which the side-walls are so curved outwards that the side plates have only to sustain or transmit tensional strains in the plane of the plate. The horizontal forces acting on the side walls are in equilibrium below through the bottom of the tank; while at the top they are resolved into tensional strains by the ring girder which runs round the holder. There is no sharp angle between the side walls and the bottom. The tank is stiffened by uniformly spaced props, which serve also to support the columns of the guide framing.

At Budapest local conditions precluded the construction of an all-steel tank. The side wall of each holder has been made as a reinforced concrete wall, 13¾ inches thick, lined with steel sheets, which take up part of the strains. The wall is stiffened by 100 reinforced concrete ribs evenly spaced on its exterior. These ribs take up and transmit the horizontal forces to the bottom or the ring girder.

The outer edge of each rib is strengthened by channel section bands, which serve both to take up tensional strains and to protect the angles of the concrete from injury. A pleasing appearance is given to the whole exterior by a simple cement or rough-cast rendering. By this method of construction there is no difficulty in making a sound joint between the side walls and the bottom of the tank.

The lifts of the holder each have an effective height of 37 feet; and their diameters, starting from the bell, are 165 feet, 167 ft. 8 in., and 170 ft. 4 in. The substance of the side sheets is 3·7 lbs. per square foot, and that of sheets of the crown of the bell is 4·9 lbs. per square foot. The sides of the lifts are strengthened by vertical stays. Special care was given to the construction of the top curb or angle-ring of the bell. The crown is supported by an arched framing of trussed rafters. The cups are constructed in the usual manner of bent sheets with flat sheets riveted to them. Tangential guide rollers are used on the top curb of the crown, and radial rollers elsewhere throughout. The axles of the rollers are of specially hardened steel; and the rollers are fitted with bronze bearing casings with ample lubrication. The columns of the guide framing are stiffened Differdinger girders, braced in the usual way by diagonal tie-rods. The framing is in four tiers, to correspond with the lifts of the holder. Steam heating is provided for the tank and cups. The contents indicator is a dial nearly 10 feet in diameter, with divided scale.

For the erection of the framing and holder, an iron trestle stage travelling on a circular railway track was provided. The bottom of the tank was riveted together on a wooden framing, and the framing for supporting the crown was erected on it and attached to an independent framing on the periphery of the tank, since the tank walls were to be in concrete. The tank bottom was then suspended from the crown framing by means of tension rods, in order that the wooden framing under it could be removed. The concrete bed beneath was covered with a ·12-inch layer of tar-asphalt, and the surface of this was made smooth so that there should be no hollow spaces beneath the bottom of the tank when it had been lowered on to the asphalt. By this means rusting of the underside of the bottom was guarded against. After the bottom had been lowered, the steel lining of the side walls and the concrete walls were constructed. When the latter had set, the superstructure of the gasholder was erected by aid of the trestle stage already mentioned.

From the gasholders a portion of the gas is delivered through the distributing governor with 32-inch connections direct into the distributing system on the Buda side of the river. The greater part of the gas, however, is pumped by a turbo-compressor installation (housed in a special building) through a high-pressure main of 24 inches diameter which is carried on the railway bridge over the Danube to the gasholder on the left or Pest side of the river.

(*To be concluded.*)

INNOVATIONS IN PIPE-LINE CONSTRUCTION.

A Distribution Committee's Report.

Having scanned last year's reports of distribution engineers in America, the Committee on Distribution of the Iowa District Gas Association voice the conviction that there have been introduced several methods heretofore practically unknown that will become standard in their respective fields of utility. In the following recently issued report, they refer, among other things, to what they state are three distinct innovations in connection with pipe-line construction: (1) Cast-iron pipe in 16 feet lengths; (2) Matheson joint pipe; and (3) autogenous welding of steel and wrought-iron pipe.

Apart from the features of leaking joints [which can easily be overcome by up-to-date joint-making] and occasional fractures from frost or other strains, for urban low-pressure distribution cast-iron pipe does not seem to have been improved upon; the 16-feet lengths simply reducing the number of joints while adding to the weight and consequent difficulty in handling.

For joint-making, the use of lead wool has been somewhat extended in large diameter cast-iron mains; the cost of applying this joint having been considerably reduced through the use of the pneumatic hammer for caulking. The principal advantage of this joint appears to lie in its relative tightness when finished. Its advocates point out that the contraction due to the cooling of a hot poured joint, and consequent shrinkage from the wall of the bell, renders useless a large proportion of the metal intended to close the joint; and that when up-set in the usual manner at the mouth of the bell, a contact bond is insured only from the face of the joint to the edge of the joint-groove in the bell, thus reducing the shearing strength of the joint. The cost of the lead wool and cast lead joints seems to be about the same; and the cost of the cement joint is so much less (usually 50 to 75 per cent.) that it is difficult to convert the man who has had a successful experience with this joint. It is, however, conceded that the lead wool joint is most readily adapted to repair work and to making-up joints in wet places.

Matheson joint pipe is a light-weight specially prepared steel pipe in lengths of about 20 feet, provided with a modification of the bell-and-spigot type of ends, designed for a joint of poured lead. The pipe is protected by a heavy bitumen coating under a spiral wrapping of burlap, followed by an additional coating of the bitumen preparation. The joint, after being made, is coated and wrapped; and properly installed, the pipe should prove of very long life. It does not, however, seem to possess any advantage over cast-iron pipe; and it is not any cheaper when fittings are included. While it will not fracture and may be bent, unless the utmost care is exercised the purpose of the coating will be defeated in covering the joints, and particularly at service connections made after the main is laid. It, no doubt, has merit for long cross country runs, where it will not have to be branched frequently, and no service connections are made.

For high-pressure work, autogenous welding is beyond question a great advance in the art of making tight lines. This process consists in joining together plain and steel pipe by means of a homogeneous weld produced with the oxy-acetylene torch. It has so far been applied more extensively to long transmission lines of large diameter, but lends itself admirably to the joining of pipe for most any purpose. It would seem probable that this practice will appeal to high-pressure operators in most districts, as it is obviously possible to render an installation "bottle-tight" under any condition of pressure.

There has been much discussion as to the relative merits of steel and wrought iron for main and service work. The latter material was formerly credited with many advantages not accorded the steel pipe; but in recent years improvement in steel pipe has largely dissipated former prejudices, until to-day it is claimed that the best prepared steel pipe surpasses wrought iron in strength and ductility, with the added advantage of lower cost. All steel or wrought-iron pipe for underground work should be thoroughly coated. Of the various forms of pipe-coating, probably none is as efficient and as easily handled after application as the zinc covering known as "galvanizing." Other coatings present difficulties in the handling of the pipe, such as the fouling of cutting dies, &c., but are more generally used because they can be locally applied and at less expense.

Every paint manufacturer has a paint for which he claims the properties required for an underground pipe covering, but the form of coating generally used is the following: Heat about 20 gallons of coal tar to a slow boiling-point, and add 20 lbs. of fresh-slaked lime, sifted over the top and then worked down. Boil the mixture until it becomes pasty. Let it settle for a few minutes, and add 4 lbs. of tallow and 1 lb. of powdered resin. Stir until thoroughly mixed and all ingredients are dissolved, then allow to cool. When ready for use, to each bulk of 45 gallons of the above mixture add 4 lbs. of crude rubber dissolved in turpentine to the consistency of thick cream. Then heat the mixture to about 100° Fahr., and immerse the service-pipe, heated to about a like temperature. The mixture should not be heated higher than 100° Fahr. If the preparation is too thick, it can be thinned down with kerosene when being heated for use. The pipe should preferably be dipped in a trough constructed for the purpose; but the coating may be applied with a brush.

CALCULATING ILLUMINATION WITH INDIRECT AND SEMI-INDIRECT LIGHT SOURCES.

Writing in the "Electrical World" (New York), Vol. LXV., p. 1463, Mr. Richard C. Powell points out that calculation from the photometric curve and height of a source of light is a well-known and commonly-used method for predetermining the distribution and intensity of illumination from a direct light source. But when indirect or semi-indirect units are employed, the usual course is to rely upon judgment or a preliminary test, which often is not convenient. In the method of calculation he has developed it is necessary to know only the photometric curve, the coefficient of reflection for the secondary source (usually the ceiling), the distance of the unit below the ceiling, and the height of the ceiling above the plane of illumination.

Giving an outline of the method he proposes, he says that any light unit produces on the ceiling a secondary light source in the form of a circular disc, generally of non-uniform intensity. This disc may, however, be considered as made up of a number of circular annuli or rings of uniform intensity of illumination. The effect may also be considered the same as that which would be produced by a number of uniformly-illuminated concentric discs of varying radii. By calculating each disc separately, and adding the results, there is obtained approximately the illumination due to the ceiling. By taking a sufficiently large number of discs it is possible to make the approximation as close as desired; but, in practice, it is usually sufficient to take four.

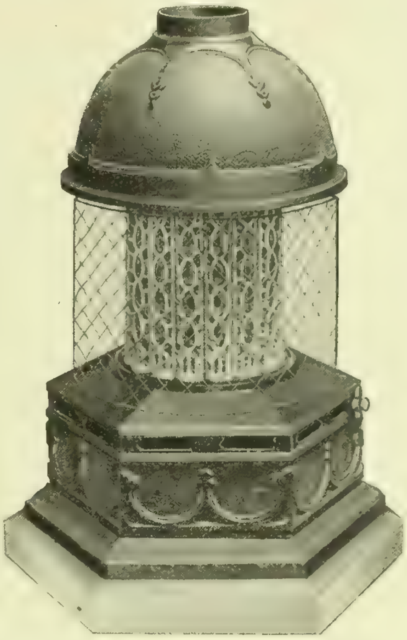
War Inventions Board.—The arrangements for the organization of the War Inventions and Research Board (under the presidency of Lord Fisher of Kilverstone, G.C.B., O.M.) have now been completed. It will comprise a Central Committee and a Panel of Consultants composed of scientific experts, who will advise the main Committee on questions referred to them. Among those on the Consulting Panel are Professor Percy F. Frankland, F.R.S., Professor Bertram Hopkinson, F.R.S., and Sir Oliver Lodge, F.R.S.

A "CIRCULAR" GAS-FIRE.

The great popularity of the gas-fire during the last few years has been largely confined to dwelling-houses, offices, and small rooms; and it has in many quarters been felt for some time that a modification was necessary to render it as popular in larger rooms, factories, and workshops as it is in the home.

In larger rooms the heat from the gas-fire has been apt to be too local; persons in front of the fire complaining of being too hot, while those near the ends of the room have not been warm enough. This defect has been particularly noticed in the jewellery trade workshops in Birmingham, where there are a large number of small factories and workshops in which the workpeople sit at the jewellers' benches arranged round the room, while there is plenty of space in the centre. The difficulty has been frequently overcome by fixing two fires back to back, with a common flue connected by a λ-piece to the two fires. The appearance of the combination, however, leaves much to be desired.

To solve the problem of how to heat a workroom satisfactorily and hygienically, a new type of "Circular" gas-fire has been introduced by Messrs. R. J. Rogers and W. E. Cadwallader, of the Birmingham Gas Department; and the accompanying illustration shows that its appearance is both neat and artistic. Among the advantages of this fire may be mentioned that radiant heat passes from the fire to all points of the compass, instead of concentrating the heat-rays in front of the fire. The canopy comes well over the radiants; and the flue, being in the centre, allows the products of combustion to escape freely through the proper channel. In addition to the large amount of radiant heat given off from the fire, the flue-pipe provides a source of convected heat, thus utilizing a high percentage of the total heat units of the gas.



A New Type Fire for Large Areas.

The fire is very powerful for its size; the one shown having sixteen radiants, or one more than in the 21-inch ordinary pattern fire; and yet it only takes up a floor space of 18½ in. by 16 in. In addition to the workshops for which it was originally designed, it is eminently suitable for school-rooms, shops, mission halls, waiting-rooms, barracks, hospital wards, &c. The flue-pipe, which may be made of japanned iron or galvanized iron painted outside, is carried vertically from the flue-outlet to a suitable distance from the ceiling, and then turns with a gentle rise to the chimney-flue or the outer air. The first portion of the flue-pipe being vertical gives the products a fairly high velocity—thus promoting efficient ventilation. The fire is fitted with a duplex burner controlled by a single plug-cock, which is ingeniously constructed so that each part or the whole of the fire may be used as desired. To prevent the cock being accidentally turned on, it is recessed in the vertical walls of the fender. The fender is in two sections, and is designed so that there are no openings close to the floor, where dust or dirt can so easily accumulate; the primary air being admitted through slots near the top of the fender.

Particular attention has been paid by the designers to the question of maintenance. The fire-brick, burners, and all parts likely to require renewal at any time, are so fitted as to be readily taken apart and re-assembled when necessary. The gas supply connection is beneath the fender, so that it may be connected, if required, without the supply pipe being exposed. Provision has been made for firmly securing the base of the fire to the floor; and suitable concrete slabs are supplied on which the fires may, if desired, be fixed.

During the coming winter, it is probable that many of the school-rooms and other buildings that have been converted into temporary hospitals will require some auxiliary system of heating, as the hot-water or steam pipes originally installed, though suitable for ordinary occasions, will be insufficient to raise the temperature to the degree necessary for a hospital ward. In such cases as these, the "Circular" fire will be a decided acquisition, being cheerful in appearance, efficient and economical in running costs, and requiring a minimum amount of attention from those in charge. The advent of this fire appears, therefore, to be exceedingly opportune, as it provides another efficient apparatus for strengthening the hand of the gas manager in dealing with heating problems.

The fire illustrated, which is of registered design, is manufactured by the Parkinson Stove Company, Limited, of Birmingham and London.

POWER PRODUCTION.

The "£ s. d." of the Question.

By H. C. WIDLAKE, M.J.Inst.E., of the Plymouth and Stonehouse Gaslight and Coke Company.

(*Continued from p.* 81.)

STARTING GAS-ENGINES AND ELECTRIC-MOTORS.

THE next argument we have to deal with is:

(*d*) It is a matter of labour and difficulty to start a gas-engine, whereas in the largest sized electric motor starting is an extremely simple matter.

The author has in his mind's eye a couple of illustrations which, some years ago, were used to demonstate one of the many advantages claimed for electric motors. The first illustration depicted a large gas-engine defying the united efforts of half-a-dozen grimy, perspiring, and apparently blaspheming men, to start her. The engine-room clock stands at about 20 minutes past the starting time; while a demented looking individual—presumably the works manager—is acting in a distracted manner that suggests the need for a strait waistcoat.

The second illustration shows the same engine-room occupied by an electric motor just gathering speed, the clock is right on the starting-up time; while a small boy in a sailor suit is pushing the starter up to its top notch. The gentlemen who in the previous picture were represented with profanity literally oozing out of them are depicted as a wide-eyed amazed group at the engine-room—pardon, motor-house—door; while the manager is grinning at the small boy like a monkey at the sight of a nut. The moral is obvious; but the first thing that occurred to the writer's mind on seeing it was that if the motor were in the same condition as the banished gas-engine, the small boy might push the starter up from then until Doomsday without achieving anything. A motor is certainly an extremely easy machine to start; but the starting of a gas-engine in good order does not present any difficulties up to a certain size, above which size self-starters are invariably recommended by the makers, by the aid of which the largest engine can be quickly got under way.

STARTING AGAINST OVERLOAD.

A much-worn argument in favour of the electric motor is that concerning the readiness with which it will start up against a heavy overload—a characteristic which, although admittedly possessed by some types [not all, be it noted] of electric motors, is at the same time one that has caused, and always will cause, that machine to be sadly abused by the average user. This characteristic has technically much in common with the question of running overloaded; and the arguments advanced in condemnation of the practice apply largely to the present case. Public supply authorities, as a rule, look with a considerable degree of disfavour upon motors which are run up against load, particularly where the lighting supply is taken off the same mains as those to which the motor is connected, and protect themselves by the insertion of safety fuses in boxes which, as a rule, are sealed and accessible only to the supply undertaking's own officials.

Even assuming that the motor, and more particularly its starting gear, is designed for starting against full load, it must not be forgotten that there is always a risk of blowing the supply authorities' fuses, and so being involved in a total failure of supply until such time as an authorized official can be obtained in order to renew the fuses. The practice of starting under full-load is in many cases a pernicious, as well as an utterly unnecessary one, against the evil effects of which the electric motor, unlike the gas-engine, cannot protect itself.

CLEANLINESS AND ATTENTION.

(*e*) The gas-engine is not a clean type of prime mover.

(*f*) A gas-engine requires constant attention; whereas attendance charges in connection with an electric motor are practically *nil*.

The electric motor certainly lends itself to the maintenance of cleanliness in its surroundings; but, advanced as a serious argument in its favour, this appeals only to a naturally slovenly machinery attendant at whose tender mercies an electric motor stands a far greater chance of breaking down than does a gas-engine. The average factory motor, whether gas or electric, is not always kept in a scrupulously clean condition; and the extent to which the presence of dirt conduces to electrical breakdowns is too well known to need enlargement.

As regards attendance, an electric motor, like a modern gas-engine, will admittedly run for long periods without attention; but a power user who employs either machine under this impression is certainly looking for trouble, and sooner or later will as certainly find it.

In regard to oiling, the modern gas-engine is automatically lubricated, and will run for many hours with one filling of the lubricators.

The attendance charge may be exactly what the plant owner is wise, or foolish, enough to make it. An example of the extent to which such folly may be carried was provided to the author about twelve months ago, when, on the occasion of a visit to a moving picture theatre, he was referred to the "engineer"—a gentleman who has forsaken the prosaic task of bill posting for the more technical occupation of sitting on a chair watching a motor generator spin around, for which he received 30s. a week.

As a general rule it may be observed that any prime mover should be given a few minutes' inspection every couple of hours. This precaution, in either case, is not necessary—it is simply wise.

RELIABILITY COMPARISONS.

(*g*) A gas-engine is less reliable than an electric motor, and renewals are frequent and costly.

It is a well-known fact that the experience of insurance companies has been, and still is, that electrical machinery is responsible for the highest proportion of breakdowns. According to the British Engine, Boiler, and Electrical Insurance Company, one in every eight of the selected motors insured by them have broken down; while, taking electrical machinery as a whole, the proportion is one breakdown to every three electrical installations. In a paper read before the Manchester Association of Engineers, in January, 1914, by Mr. Edward G. Hiller, the Chief Engineer to the National Boiler and General Insurance Company,[*] the reliability of small gas-engines is demonstrated in a very remarkable manner, and by Mr. Hiller's permission the author is privileged to include the following interesting particulars in this article.

TABLE VI.—*Reliability of Different Types, as indicated by: N, Number of Breakdowns; R, Number of Breakdowns × Cost of Repairs per Breakdown.*

—	N. Number of Breakdowns. Steam-Engines Taken as 1.	R. Number of Breakdowns × Cost per Breakdown. Steam-Engines Taken as 1.
I. Steam-engines	1·00	1·00
II. Steam-turbines	3·36	6·30
III. Gas-engines up to 14-inch	0·60	0·24
IV. Gas-engines, 15 to 24 inch	2·82	3·01
V. Diesel engines	3·00	3·75

The following is a quotation from Mr. Hiller's paper:—

> "These reliability statistics are derived from the experience of the National Boiler and General Insurance Company, Limited. They represent experience on this particular characteristic up to date. They, of course, are not permanent figures; the reliability of different types may be altered or improved by changes in the character of the maintenance, by increased care in driving, by improved construction, material, or design. Any type, therefore, may progress from a low degree of reliability to a high degree, as, indeed, has been the experience in the past.
>
> "Column N (Table VI.) represents the relative number of breakdowns of engines of that particular class per annum; the figures of steam-engines being taken as 1.
>
> "It is to be recognized, however, that the importance of breakdowns or stoppages is to be measured not only by the number, but also by the cost of making good. Column R has been added to represent the relative figures in this respect; steam-engines being reckoned as 1. A broad survey of these figures indicates that steam-engines, in respect of reliability, stand at the head of prime movers for comparatively large powers. The small gas-engines up to 14-inch diameter show even better results than steam-engines of all sizes, but the larger gas-engines, on the other hand, by their higher figures of the number of breakdowns and cost, show a substantially lower degree of reliability."

Unfortunately, no mention is made in this table of the claim of the electric motor as regards reliability; but the returns of the insurance companies certainly prove that the percentage of breakdowns among insured electric motors is higher than that among insured gas-engines. This may be due to the fact that electric machinery is usually underrated so far as capacity for continuous working is concerned; while it is liable to be stopped by the legitimate action of the very devices which are inserted for its protection, or, in the case of a public supply, by some accident outside the factory.

The question of reliability is closely associated with insurance rates; and the following table gives the respective rates charged by one of the leading insurance companies for gas-engines and motors. The rates for electric motors are decided by the horse power, and not (except in very special cases) by the type of machine; while among the factors that decide the gas-engine rates are the number of cylinders, the diameter of the same, and the piston speed.

The rates in Table VII. are approximate, and are based on the assumption that the engines have one cylinder and are worked on town gas.

TABLE VII.—*Insurance Rates for Gas-Engines.*

Approximate Brake Horse Power.	Approximate Diameter of Cylinder and Length of Stroke.	Amount Insured.	Approximate Annual Premium.		
	In. In.	£	£	s.	d.
7	5 by 10	50	1	2	6
11	6 by 12	50	1	5	0
21	8 by 17	50	1	17	0
51	12 by 22	100	4	1	0
80	15 by 20	200	6	7	0
115	17 by 24	200	8	10	0

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[*] See "JOURNAL" for Feb. 3, 1914, p. 294.

TABLE VIII.—*Insurance Rates for Electric Motors.*

Approximate Brake Horse Power.	Amount Insured.	Approximate Annual Premium.
	£	£ s. d.
7	25	1 13 0
11	30	2 1 0
21	50	2 15 0
51	75	4 2 6
80	125	5 4 0
115	175	6 10 0

The statement that renewals to gas-engines are frequent and costly is not borne out in practice; and it may safely be said that an engine upon which a reasonable degree of attention and care has been expended will run its entire life—say, 20 or 30 years —without involving its owner in any heavy maintenance charge. It is quite sufficient to thoroughly clean the engine every three or four months, and to make the necessary small adjustments to the valve-gearing which will tend to keep the engine in an efficient condition.

AGE DEPRECIATION.

It has been stated by electrical enthusiasts that depreciation with age is more rapid in a gas-engine than it is in an electric motor; but this is a fallacy which must be obvious to any who have had any experience of both types of prime movers. In a gas-engine diminished efficiency due to age is usually a matter which can be rectified in a very short time, and at a trifling cost; while in a motor its cause is not so apparent, and its remedy a matter of delay and heavy expense.

An internal combustion engine usually gives ample warning (often weeks beforehand) of anything going wrong, and thus permits of the "stitch in time" being applied before an actual breakdown takes place. The occurrence of a fault on an electric motor, however, usually means an immediate shut-down, and occurs without any previous warning, involving a startling transition from satisfactory working to a dead-stop, with all the attendant inconvenience—dislocation of business and diminution of output.

SPACE OCCUPIED.

(*h*) A gas-engine takes up a relatively larger amount of space than does an electric motor of equal power.

The space taken up by most forms of power motors is inversely proportional to the speed at which they are designed to deliver their rated output. Let us take as an example the engine of a certain well-known 15 cwt. commercial motor vehicle. With a bore of 80 mm. and a 110 mm. stroke, this engine is designed to develop 15·9 H.P. at 1200 revolutions per minute, and occupies an area of certainly not more than 4 square feet—weighing something in the neighbourhood of 20 to 30 lbs. per B.H.P.

An ordinary industrial stationary engine, on the other hand, rated to give this output at a speed of (say) 250 R.P.M. would occupy a floor space of about 30 square feet, and weigh about 2 tons, or (say) 140 lbs. per B.H.P. The same relationship between power, speed, and space occupied exists with regard to the electric motor; while in this instance the price of the machine is inversely proportional to the speed. The following list, taken from the publications of a well-known firm of motor manufacturers, gives interesting data regarding six 25 B.H.P. motors of different speeds, together with their efficiencies, space occupied by motor and slide rails, and their weights.

TABLE IX.—*Particulars of* 25 B.H.P. *Electric Motors.*

Speed.	Approximate Price.	Efficiency.	Net Weight.	Area Occupied.
R.P.M.	£	Per Cent.	Lbs.	Square Feet.
1150	62	90	1484	11
760	75	88·5	1850	14
520	87	88	2800	17
270	127	87	4216	23
230	153	85·5	5866	24
190	165	85	6970	26

From these particulars, it will be obvious that the average electric motor is a high-speed machine, and that the cost of its manufacture increases largely with diminution of speed, as does also the weight and the floor space occupied by the machine.

QUESTION OF SHAFTING.

For the usual commercial purposes a high-speed, and hence a comparative low-priced, motor is offered; but it must be remembered that the expenditure does not always end with the motor and its switchgear. Means have to be provided to reduce the high motor speed to the figure at which the line shafting has to be run; and, in addition to the expense involved by the provision of a countershaft and belting, it must not be forgotten that this gear involves a continuous transmission loss, and hence increased running costs.

It has been argued that a motor can be run direct on the line shaft; but in the case of a high-speed machine this requires the use of an abnormally large pulley on the shaft. The head room available does not always permit of this; and a compromise often arrived at is the use of as large a driven pulley as possible on the line shaft and a small pulley on the high-speed armature shaft. This practice, to the writer's mind, constitutes the limit of imbecility, and can only conduce to a high percentage of slip, heavy consequent power losses, the ruination of belts, and a generally inefficient state of affairs, compared to which the losses in an additional countershaft fitted with reasonably designed pulleys would have been much preferable. On the plant under the writer's charge small diameter pulleys on high-speed shafts are strictly tabooed; and main belt drives from electric motors running at 3000 to 4000 feet per minute are not uncommon, and give the greatest satisfaction; while the belts considerably exceed the period usually allowed for depreciation of belting.

GAS-ENGINE COOLING TANK.

Astute electrical enthusiasts, waking-up to the fact that cooling tanks as used on gas-engine installations occupy space, pounce upon the fact with avidity, and wear it threadbare in their efforts to dress it up in the light of a serious reason why a gas-engine should be banished. Incidentally these tanks can be made to perform a very useful purpose, and will provide a constant supply of warm or hot water for commercial purposes, or for the feed to small boilers. In a case recently under the writer's notice, the feed for a 40 H.P. Babcock and Wilcox boiler was drawn from the tanks of a 15 B.H.P. gas-engine. This supply was at an average temperature of 120° Fahr., and resulted in a saving of 20 cwt. of coke per week, as compared with the time when a cold feed was used. The generation of heat is inseparable from the employment of internal combustion engines, and may be looked upon as a valuable residual if intelligently utilized and controlled.

BONECOURT WASTE-HEAT SYSTEM.

The advent of the Bonecourt waste-heat boiler has placed within the reach of the small power user a ready means by which he can utilize the heat units contained in the exhaust gases from his gas-engine, and so obtain a regular supply of hot or boiling water over and above that with which his circulating water-tanks will provide him. As a general rule, the heat contained in the exhaust gases of internal combustion engines is entirely wasted, and may easily amount to as much as 30 to 40 per cent. of the total heat supplied to the engine. Its amount will depend upon the make of the engine, its condition, the method by which it is governed, and the load factor under which it works. If the waste gases are exhausted direct to the atmosphere or through a silencer, the whole of this heat is wasted, and, being a continuous loss, it is bound to be a serious one.

In the Bonecourt system, the exhaust gases are led through a boiler of special construction, in which a large percentage of the heat is utilized in the raising of the temperature of the water or the generation of steam. It has been found practicable to deliver about 2 gallons of boiling water per B.H.P. per hour from a feed temperature of 60° Fahr. Putting this into brief figurative statement, it means that from the exhaust of a 60 B.H.P. gas-engine working at full load, over half a ton of boiling water would be obtainable. The author would suggest that if the feed for such a boiler were taken from the engine circulating tanks, instead of from the main, this already excellent figure would be greatly improved upon.

Even if a user of an internal combustion engine cannot obtain all the steam or hot water he may want from this source, he may just as well get all he can from the heat that otherwise is being wasted. The proposition thus becomes of very great importance to gas companies, since anything that tends to increase the usefulness and efficiency of the gas-engine will tend to increase the sale of gas for power purposes. This boiler acts as a very effective silencer, while it does not throw any undue back-pressure on the engine.

AGE AND EFFICIENCY.

(*i*) The efficiency of a gas-engine decreases largely with age, while it is wasteful at light loads.

This statement, like many others of a similar nature detrimental to the gas-engine, does not find corroboration in actual practice. There are hundreds of 20-year old and upwards engines operating at practically the same efficiency as they attained when first installed. Any diminution of efficiency in a gas-engine is invariably due to some slight adjustment being necessary; and in most cases the outlay required to restore an engine to a state of efficiency is trifling.

Omitting capital and depreciation charges, and dealing with running costs only, it will be observed, on reference to Table I., taking the case of a 30 B.H.P. gas-engine the hourly full load consumption will amount to 609 cubic feet, which, at the rate on which the table is based, would cost 9·7d. Turning to Table II., we find that a 30-B.H.P. electric motor, running under exactly similar conditions, will consume 25·7 B.T.U. per hour, and cost 38·5d. In other words, on the basis of running costs alone, electrical energy would have to be retailed at under 0·4d. per unit before it could compete on economical grounds with town gas at 1s. 4d. per 1000 cubic feet.

Putting this argument in still another form, the 30 B.H.P. gas-engine, in its decrepit old age, would have to deteriorate into such a scandalous state of disrepair as to consume $\frac{20\cdot3 \times 38\cdot5}{9\cdot7} = 80\cdot5$ cubic feet of gas per B.H.P. per hour before the claim of the electrical enthusiast in this respect could be commercially justified. Having regard to the consistent manner in which gas-engines invariably operate, the author is aware this argument is now carried to an absurdity; but such a method is sometimes necessary to entirely squash an argument which is, in itself, absurd.

As regards the light load efficiency of gas-engines it is certainly true that a gas-engine is least efficient at light loads, and, incidentally, the same statement is perfectly true of the electric motor.

The frictional losses in a gas-engine are much the same at all loads; and except at the lightest load, the gas consumed per I.H.P. will remain practically the same.

RELATIVE OVERLOAD CAPACITIES.

(*j*) The overload capacity of an electric motor is very high, while that of a gas-engine is limited.

No argument in favour of the electric motor has been worn so utterly threadbare as this particular one, and, incidentally, nothing has led to the abuse of the machine in whose favour it is advanced more than has this particular characteristic. Its consideration immediately brings us to the whole vexed question of lighting. An electric motor or a gas-engine, or any type of prime mover, is either suitable for the load under which it has to operate, or it is not; and the more clearly this is recognized, the more strikingly apparent will become the folly of ever allowing this argument to become a serious factor in power competition. Electric motors are always rated on a thermal basis—namely, upon the length of time over which they will carry a given load with a given rise of temperature. This rating ensures that the motor will not be subjected to a temperature which can be detrimental to the insulation of its windings. A motor that is so rated will be found quite capable of operating under a load considerably in excess of its capacity expressed upon this basis, but it is a sure thing that frequent or prolonged abuse of this description will inveitably result in the total destruction of the windings, the insulation of which in such circumstances must tend to become brittle, and to lose its dia-electric properties.

In the case of the gas-engine, its fly-wheel may be regarded as a reservoir of power which is available in the event of a sudden demand for a short period; and such a machine rated to take (say) the normal load of a small factory, will be enabled to deal with the constantly recurring peaks, because of the energy stored up in the heavy rim of the revolving fly-wheel, which starts to expend itself immediately upon a slight reduction of speed caused by a big demand.

An electric motor, on the other hand, has to be rated upon approximately the maximum demand provided it is desired to run it within the limits of safety. In short, a good make of either form of prime mover is rated upon a basis which its manufacturers consider a safe one; and if this rating is exceeded, the effect is bound to be a detrimental one.

To a certain extent a gas-engine protects itself against this form of abuse by slowing-up under a heavy overload; but an electric motor does not do so to anything like the same extent, and may under such conditions continue to run along to its final destruction.

The capacity of a good gas-engine to take an overload and exercise a large starting torque was dealt with at length in a short article by the writer on an unusual transmission difficulty at a local laundry* which was solved in an eminently satisfactory manner by the Company with which he is associated; and at the risk of being accused of repetition, he feels that this argument cannot be dealt with in a proper manner without a reiteration of the explanation that was made in that article as to the factors which determine the overload capacity of any prime mover.

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* See "JOURNAL" for June 22, p. 695.

(*To be concluded.*)

MIXING OF THE GASES IN THE BUNSEN FLAME.

At a Meeting of the German Physical Society last year, Professor Haber reported observations he had made on the bunsen flame, which the "Zeitschrift für Beleuchtungswesen" thinks may have practical bearing on the construction of burners.

It is well known that a bunsen flame, fed with coal gas, begins to smoke first at the tip, and not at the side, when the supply of air is reduced. Professor Haber observed the same phenomenon when the burner was fed with benzene-air-gas; and he found by analyses that there was a richer gas near the tip of the flame than at the sides. But when the burner was fed with a mixture of hydrogen and air, the flame first began to smoke at the sides, instead of the tip; and it was found there was more hydrogen on the outside than in the core of the cone. Benzene is heavier and hydrogen lighter than air; and it appears that a separation of the constituents of the uniform gaseous mixture occurs in the cone—the heavier remaining in the core and the lighter going to the envelope. No such separation occurred when the gas issued from the burner unlighted.

Professor Haber considers that the changes of pressure and density produced by the flame bend or twist the lines of the gas current before it enters the inner cone, and thus cause accelerations or velocities, such as occur in a centrifugal machine, on a sufficient scale to effect differences (detectable by analysis) in the composition of the gaseous mixture at the tip and the sides of the cone. Professor Warburg has suggested that the separation observed might have been due to fall of temperature, since different parts of the flame are at different temperatures. Professor Haber, however, considers that such a fall cannot be great, because the gas loses by convection the temperature it acquires by conduction. He intended, however, to pursue the study of the question.

RESEARCH IN TECHNOLOGY.

Mr. Charles Carpenter, D.Sc., on the Need for a Royal College of Technology.

Mr. Charles Carpenter, D.Sc., the Chairman of the South Metropolitan Gas Company, and President-Elect of the Society of Chemical Industry, delivered a paper entitled "Research in Technology" at the annual conference of the Society of Chemical Industry at the Manchester School of Technology last Thursday.

In introducing the subject, Mr. Carpenter said it was significant that the theme chosen by the Council for discussion was given prominence to in the inaugural address delivered by the first President of the Society of Chemical Industry in the City of Manchester thirty-three years ago. When pleading the case for research as applied to the chemical industry, Sir Henry Roscoe expressed the belief that while the British manufacturer was often late in adapting his methods to the ever-changing circumstances of the time, he was not often too late. There must, he proceeded, be many present whose considered opinion a year ago would have been that such hopes had been in the main unrealized, and were even farther than ever from achievement. Disregarding the royal exhortation to "Wake up," the Nation continued to surrender the care of its existence to political quacks whose skill lay mainly in mesmerizing its reason and blinding its intelligence. A rousing, with terrible force, had come at last, and it turned from false gods to Science, realizing that civilization unarmed by her was helpless. But it was useless to expect to find in distress an armoury unprovided in times of peace. By diligent, unremitting, and long-continued work alone could such provision be made; and this was no less true of chemical than of all other industries which went to build up the power that was designated as Applied Science.

Such was research, whether chemical or industrial. Both needed undertaking equally, not only to provide present and certain requirements, but future and possible ones. The chemical industry of to-day could not make progress without research of both kinds. This was why the meeting was not concerning itself with particular processes or manufactures, but with the broad foundations which were an absolute essential of its stability. That research (Mr. Carpenter continued) must commence with the chemist went without saying. Circumstances had, however, changed since the inception of the first great chemical processes. The technical demands made by modern manufacturers were much more extensive and exacting, and sole reliance upon the chemist would be fatal to the realization of success. Sooner or later the aid of the technologist must be called in. His equipment for the task had now to be discussed, and it was easily seen that it was on a very different footing to that of his confrère, for it must be carried out on a large or working scale. Surely here was an overwhelming case for localized centralization, if one fact, and one fact only, was borne in mind. It was not from or among themselves that the greatest competition was to be feared, but from producers over the seas already organized. Let, then, every special industry build up its own schools or institutes of technology, not only to provide training for workers, but so fully equipped with resources that problems of all kinds could be submitted to them for research. It might be said that one manufacturer would be contributing to progress made by another. This might be true; but it would be better for him to put a small tax upon his profits for such a purpose than, by want of united effort, risk losing his trade altogether. It might be argued that the risk would be a great one in reposing so much confidence with the principals of such organizations. But if they distrusted their physicians, they would run the risk of being decimated by disease. Was there one in a thousand who distrusted his adviser in sickness? Why should the physicians of industry be disloyal or less honourable? Such institutions as suggested would be clearing-houses for troubles to which manufacturers would automatically turn whether perfecting an old process or working out a new.

THE COMING INDUSTRIAL BATTLE: HOW TO MEET IT.

If as a nation they were to emerge successfully from the industrial battle which was awaiting them, they must pool not only their difficulties but their solution. When it was required to start new processes or adaptations, it would never do for each manufacturer to proceed as was now the case—viz., start *de novo* and work out for himself methods of its industrial application which were already known and used in other directions. He would get it from the institutes. If—as in some cases—the information as to certain methods of plant was confidential, he would be put into communication with the users, and matters might then be left to develop on ordinary business lines.

Stated another way, the proposal was for manufacturers to be able to draw upon sources of technological knowledge just in the same manner as did the chemist from a scientific library—without such aid the foreign competition of the future would never be mastered by them. Such centres of research as advocated already existed. It was not necessary to go outside the City of Manchester for a splendid example of what could be provided by a far-seeing Council. Whether their provision was supported and their resources drawn upon by manufacturers in the manner suggested could not be stated. But even when every industry throughout the land had its centre or centres of technological research, the structure upon which the Nation's chemical industries was to be securely established was still incomplete, the arch was without its keystone, the bonding absent of each component. Their directors had been likened to the physicians of technology. Why should not technology, like medicine and surgery, have its college of control, inspiration, and direction? State-aided, and therefore independent, keeping in touch with all technical progress and requirements through the media of the many associated institutes throughout the land, a Royal College of Technology would raise and promote chemical industry to the dignity it deserved as a branch of Science, and encourage the utilization of the knowledge which was fundamental to the maintenance of our position among the Nations of the world.

RESEARCH AND CHEMICAL INDUSTRY.

Dr. M. O. Forster, F.R.S., of London (a member of the Technical Committee established by the Research Department of British Dyes, Limited, under the chairmanship of Dr. G. T. Morgan, F.R.S., of the Royal College of Science for Ireland (Dublin), which Committee also includes Dr. J. C. Cain, Editor of the "Journal of the Chemical Industry," and Mr. J. T. Turner, Technical Director of Messrs. Read Holliday and Sons, of Huddersfield), contributed a paper entitled "Research and Chemical Industry," a summary of which, together with the suggested scope of a Chemical Intelligence Department to be instituted by the Government as a Branch of the Board of Trade, is given.

Dr. Forster said the first necessity for a closer union between research and industry was the development of a healthy public opinion on the subject of acquiring knowledge in general, scientific knowledge in particular, and, more important than either because it covered both—national wisdom. In order to do this, speaking bluntly, our Governments must advertise scientific methods of business and education by the employment of such methods in their own operations. This was no more undignified than raising an army by advertisement; and, after all, what was advertisement but the act of making known—in a word, education itself? In the establishment of such opinion an important place should be given to the work which chemists did—the part which chemistry had played in the national economy, and the possibilities offered by a wider application of chemistry to industry—in order to attract to our ranks the type of young man able to use chemical training as a weapon for making chemistry pay. Next, though many enlightened manufacturers already made good use of chemistry, their numbers must be increased, and the new comers must not be too quickly discouraged by what might seem initially an unprofitable investment. One of the ironies of their present position was that a yearly outlay on chemists and a laboratory, moderate even if regarded as a frill or luxury, would often make relatively small inroads into the profits of a concern; while regarded as an investment, would be positively gilt-edged compared with many of the enterprises for which the public were invited, frivolously and successfully, to subscribe millions.

Promoters had had enormous profits from hundreds of shaky home flotations; and all this with little or no inquiry or investigation or foresight on the part of capitalists, traders, or other investors. On the other hand, it had been recently claimed by Mr. W. J. Dibdin, for many years Chief of the Chemical and Gas Department of the Metropolitan Board of Works and the London County Council, that "the operations of the Chemical Department of the London County Council and the Metropolitan Board of Works effected a saving in one particular item of £10,000,000 capital expenditure to the ratepayers of London," and, he added, "the ratepayers of London have acknowledged the work done by its chemical technologists by abolishing the department." Such misdirection of effort could only lead to disaster. It was not to be expected that when the war was over there would be any mitigation of "Gott strafe British Dyes, Limited," and any other industry which ventured to raise its head; and the situation must be faced with resolute courage and all the resources of our people, both material and intellectual. He ventured to lay before the Society, as a basis of discussion, the draft of a scheme for a Chemical Intelligence Department which, in his opinion, should be established by Government as a branch of the Board of Trade. Having placed this in the hands of Mr. Runciman and Mr. Pease on May 6, he had secured the permission of these gentlemen to use it on the present occasion; making it clear, however, that it represented his own personal views, and not the considered opinion of the deputation as a whole. In doing so, he ought to mention that he had not then read the article by Sir William Ramsay which appeared in "Nature" for May 20, and which covered a portion of the same ground. Furthermore, it was not contemplated that clauses A (2) and A (3) would conflict with the operations of chemists in consulting practice. On the contrary, under A (5) these clauses should assist in rendering those operations more widely appreciated—recognizing, as he gladly did, that the work of such chemists was frequently more entitled to be called "research" than much that is published in the journals of unapplied science.

Suggested Scope of a Chemical Intelligence Department to be Instituted by H.M. Government as a Branch of the Board of Trade.

A.—Technical.

(1) Classification of chemical discoveries at home and abroad as evidenced by (*a*) patent specifications, (*b*) scientific memoirs.
(2) Distribution of chemical information to scientific inquirers and to manufacturers seeking new developments or desiring to improve existing processes.
(3) Collection of information regarding the most suitable materials for constructing chemical plant and apparatus on a manufacturing scale, and the most convenient sources for supply of such plant and apparatus.
(4) Tabulation of the bye-products arising in various chemical industries, and consideration of the most profitable ways of utilizing these.
(5) Presentation of problems arising out of (3) and (4) to the numerous research chemists throughout the country, such problems to be offered under proper discretionary safeguards and with appropriate remuneration.

B.—Techno-Commercial (by co-operation with the Board of Trade).

(1) Classification of foreign chemical products in respect of their distribution throughout the world, with ruling prices, tariffs, cost of transport, and, where possible, cost of production.
(2) Classification of the resources of the Empire and friendly nations in raw materials, for the purpose of finding novel applications of these.

C.—Techno-Educational (by co-operation with Board of Education).

(1) Classification of data regarding opportunities for chemical instruction and research in various parts of the Empire, and comparison of these with those offered in foreign countries.
(2) Consideration of possible improvements and extensions in existing Imperial methods suggested by the information thus gained.
(3) Consideration and, where possible, application of methods by which wage-earners of good conduct and adaptability might be trained as technical foremen.

DEVELOPMENT AND CONTROL BY PUBLIC INFLUENCES.

Professor H. E. Armstrong (Warrington), in the course of a lengthy paper entitled "Development and Control by Public Influences," expressed the view that scientists were, seemingly, too hopelessly individualistic to organize themselves. The Royal Society, which was the supreme authority in science, declined the task early in the year; and it was not likely that politicians would seek to bring them together, as they had no understanding of the use to which they might be put in their service. As a body they needed to "wake up" and intervene actively in the promotion and protection of chemical industry.

Touching upon the importance of research work, he suggested, considering the small amount which was being spent in research work in the coal and iron trade, that a small tax should be levied, which should be applied to the full scientific study, under competent control, of every particular connected with the industry.

He would extend this proposal to all industries in which the maintenance of research departments was necessary. One part of the tax should be applied to the upkeep of proper works' laboratories, and another part to the development of research work in places of higher instruction. In cases in which the industry was alive to its own interests and maintained a proper scientific establishment, due allowance would be made, and the contribution exacted would only be that required for public purposes in support of technical education. The necessary interlocking of industry and education would at once follow from such a course of action; Government intervention would be reduced to a minimum; and all sensible manufacturers who desired not to go-under would make due provision for the scientific control of their industry.

After referring to the importance of further research into the dyestuffs question, Professor Armstrong said it would be needful for them, as a body, sooner or later to move in the matter of the Patent Laws, to consider to what extent, in future, a specification shall be a disclosure and description of the invention for which protection was sought. Their plain duty in the Society of Chemical Industry was to organize themselves, and when they were organized to claim the right to guide the Government. But, unless the representatives of science subordinated their individualism—sunk their differences and formed a complete coalition of forces—no public impression would be made.

It rested with the Royal Society to give the impulse and to start reform, by reforming itself—waking up from its academic slumbers, and playing the active part that it was possible for it to play if it only realized what it could do as a live institution. It was their scientific House of Peers. It was not only representative of all branches of experimental and observational science, but industrial science had its place in our ranks, although it was to be confessed that they were ultra-academic at present, and needed a far larger leaven of men accustomed to apply science to practice.

Owing to the development of the special societies, the Royal Society was no longer of consequence as a scientific society in the ordinary sense. Unless the forces at its disposal were used effectively, it would cease to be of service, and there would be little satisfaction in belonging to it. The Society must be organized as a democracy. At present, it was little short of entirely in the hands of a ring of all but permanent, autocratic officials, and the Fellows had but little part in its proceedings, as the Council in no way represented the desires and ideas of the Fellows.

CHEMICAL ENGINEERING.

Mr. G. T. Beilby, D.Sc., F.R.S., in the course of a paper on "Chemical Engineering," touched on several points of interest, treating the subject as a central feature in works' organization rather than as a question by itself. He said that in modern organization there was room for the research chemist of high and wide attainments, for the scientifically trained engineer (also of wide attainments), and for a type of professionally trained man who was the natural medium of interchange between these two specialists. This intermediary was the chemical engineer. He must be a man of special aptitudes, inasmuch as he must have grasped the chemists' point of view as well as the engineers'. The chemist thought and worked in terms of atoms and molecules and the laws which governed their combination. The engineer thought of matter in masses which could be moulded to his will by the craftsman, or of mechanical or electrical energy which could be generated, controlled, and measured by machinery. The chemist was the master and director of his own operations, which he could for the most part carry out with his own hands. The engineer lost his direct hold on his operations whenever his ideas had been fully committed to paper in the drawing office. It was his special function to organize the labours of many workers.

A certain number of men were able to enter fully into the spirit which actuated both types of expert—the chemist and the engineer. They could resist the particular exclusiveness of each, while giving to each its due weight. These were the naturally gifted chemical engineers who in one sense were "born not made." In our colleges and universities the best that they could do for men of this gifted type was to give them the best possible opportunities for an all-round development of their powers. For the average men, they ought to provide a properly organized course of training in theoretical and practical chemistry, physics, and mechanics, on professional, not on purely academic lines. Our colleges had thus two distinct functions to perform, and it was best that this should be clearly recognized, first to allow the future leaders in Applied Science to come naturally to the top during their training, and, secondly, to prepare a large number of well-trained professional men for the organization and development of industry. The ideal for these men must be a professional one. The ideal that "every man in the ranks ought to realize that he carries a Marshal's baton in his knapsack" was as false as it was unpractical. It would never help the drill sergeant to produce useful soldiers, nor the commissioned officer to acquire sound knowledge of his profession. It was to be feared that the making of practical chemists had suffered severely from a similar fallacy—namely, that all students ought to aim at being pioneers in some branch of their science. Science and industry alike called aloud for real pioneers, for without them the highest type of progress could not be realized. This call, however, could not be met by the premature stimulation of "originality" in men of very ordinary endowment. The effect of this stimulation was not merely futile, it was positively mischievous; for it raised an ideal which for the ordinary man was quite inappropriate during his preparation for a life of serious practical endeavour. The phenomenal development of chemical industry in Germany had resulted much more from the large command of chemists and engineers of sound professional training and ability than from the possession also of an even larger supply of research chemists of mediocre ability.

DISCUSSION.

Professor Henderson, who presided, said, with regard to the establishment of a Commercial Information Bureau, that the Council had given serious consideration to the question during the year. They could quite understand, however, that such a scheme could not be carried out without considerable expenditure. Failing its establishment under the *ægis* of the Government, he hoped the Society themselves might take up the question, for there could be no two minds as to its immense desirability from the commercial and the National points of view. As the Society of Chemical Industry existed largely for the benefit of manufacturers, it seemed to him that it was up to the Society whether they should not undertake the institution of such an intelligence department as had been suggested.

Mr. H. M. Ridge contrasted German technical procedure with our own. In that country, the manufacturers of a particular commodity—spelter, for instance—met together and discussed spelter in one close, united body. They discussed nothing else but spelter; extraneous matters were not introduced. Another thing was that no shorthand notes were taken of technical meetings in Germany. He suggested that, perhaps, something of the sort might be advisable in this country.

Mr. F. H. Carr (Nottingham) heartily congratulated Mr. Carpenter on his excellent contribution. He cordially agreed with him that manufacturers should be able to draw upon sources of technological knowledge just in the same manner as did the chemist from the scientific library. With regard to the establishment of an Intelligence Bureau, it seemed to him to be predestined to failure unless the Society had some very large guaranteed funds behind them. Such a bureau should be supported by the Government; and he hoped that, if and when it was formed, the Society of Chemical Industry would see that they were properly represented upon the management. Another thing badly needed in every large centre—where not already existing—was a complete technological and technical library, in order that books could be readily consulted by members.

Mr. R. H. Clayton (Messrs. Hardman and Holden, Limited, of Manchester) agreed with the last speaker in regard to the establishment of technological libraries in important industrial centres of England—say, Manchester for the Lancashire district, Leeds for the Yorkshire district, Birmingham for the Midland district, and so on. Such technical libraries should be founded and maintained out of the funds of the Council, so that students who had been trained at various technical schools would be enabled to have access to literature that would be useful for their further investigations.

Mr. T. Tyrer (London) complimented Mr. Carpenter and the other authors of papers on the excellence of the technical fare provided. He thought that other scientific societies—seeing that what they were proposing to do would benefit all—should be approached with a view to bringing before the authorities the need for the establishment of an Intelligence Bureau such as had been advocated.

Professor H. E. Armstrong (Warrington) reminded the meeting that Mr. Carpenter had distinctly stated in his address that "such centres of research as advocated already exist." Further, he also said: "It is not necessary to go outside the City of Manchester for a splendid example of what could be provided by a far-seeing City Council." He (Professor Armstrong) congratulated Dr. Forster on his appointment as a member of the Technical Committee established under Dr. Morgan, and hoped that he would bring his great influence to bear in the establishment of a Chemical Intelligence Department of the Board of Trade on the lines he had himself suggested. Until they got men like Dr. Forster in the House of Commons [Dr. Forster is prospective Conservative candidate for Blackburn], they could not hope to get along as fast as they desired. As to technical education in Manchester, he asked whether there was sufficient co-ordination between the two departments of instruction. Were the Manchester City Council working in full harmony with the University? Was there not too much elementary work being done in the Manchester Institute of Technology, and far too little of the higher branches of study? It was a question of primary importance to the city whether, in relation to other scientific branches of the University, the Institute of Technology was really of the importance to Manchester that it should be. Mr. Carpenter had certainly drawn attention to a most important aspect of technological work in asking whether the institution was supported as it should be, and its resources drawn upon by manufacturers.

CENTRAL TECHNICAL LIBRARIES.

Mr. J. Maxwell Garnett, M.A. (Principal of the Manchester School of Technology), said that the Manchester City Council was the only education authority in the country that was financially responsible for the management of a University institution. All the different faculties worked harmoniously together, and there was little or no overlapping. The reason why more young men did not remain at the school in order to be trained in research work was because the demand for their services was greater than the supply. At least three appointments were offered to every two men who graduated; and this had been the case for the last three or four years. It was true that a certain amount of elementary work was still being done in the School of Technology; but this was to some extent unavoidable, as when the first beginnings were made a hundred years ago towards the establishment of a School of Technology it was intended that the school should be used for the purpose of enabling students and artizans (who were for the most part occupied in ordinary work during the daytime) to continue their studies in the evenings. It was very difficult to persuade men who were not in a good financial position to remain at the school to continue their studies; and the Manchester Education Committee had recently decided to increase the amount allowed for research work.

Dr. Louis (Newcastle-on-Tyne) said he was not in agreement with the proposal to provide libraries for particular industries at the public expense. If the merchant princes of this country were approached in a right manner, all the necessary money would be forthcoming. He was opposed to central authorities, or the Government being called upon to do the work.

Sir William Ramsay said it was important there should be no overlapping. What was required was a scheme of centralization. He referred to the existence of the technical library at the Manchester University.

Dr. Forster, in replying on the discussion, said it was practically impossible for a Society such as the Chemical Society to establish a bureau on the lines suggested. It would cost at least £5000 a year; and the scheme would have to be worked on a systematic basis. It would, however, be of enormous value to the country if only for the fact that the Government would have become permeable by the scientific idea. [Laughter.]

RESOLUTION AS TO LIBRARIES.

The President read the following resolution, and expressed the hope that it would be passed without dissent:

> "That, in the opinion of this meeting, Central Technological Libraries, complete in all respects as regards patent literature, British and foreign journals, and text-books, should be founded at the public expense in all great centres of industry, and that such libraries should be arranged on lines similar to those of the Patent Office Library in London."

The members, however, did not approve the full terms of the resolution; and in the end the meeting unanimously adopted the following:—

> "That this meeting is of opinion that the establishment of Technical Libraries throughout the country is of urgent National importance."

After the reading of the papers,

Sir William Ramsay said they all knew that a good many mistakes had been made in the past. They must not, however, trouble about past mistakes, but try and do better in the future. It appeared to him that the author was perfectly right in saying that what was required was a Government Department which could deal sensibly with scientific progress and operations of all kinds. This ideal might be cherished; but he was afraid it was impossible of achievement—at any rate, by political means. Still, there existed the Royal Society, one of the most ancient institutions in the country, which enjoyed royal patronage, and received assistance from the Government. It was a means of communication between the outside world and the scientific world.

Professor LOUIS, referring to the importance of research work, said it was essential that professors should be consulted on industrial problems of the day. He made it a condition, before accepting the chair at Newcastle, that he should be allowed consulting practice, because if a man did not keep himself informed of the industrial problems of the day he very quickly dropped out of touch with what was going on. If they were consulted on these urgent industrial questions, they kept up-to-date; but if they were not, there would be nothing in text-books to guide them. Much valuable time would therefore have been lost, because by the time a thing got into the text-books it had probably been replaced by something better. Regarding Professor Armstrong's suggestion with regard to a small tax on coal and iron products, to be applied for the advancement of research work, some four or five years ago he was consulted by the coalowners of South Wales regarding technical education in coal mining, and the question of cost cropped up. He suggested to the owners that they should commence to tax themselves one-tenth of a penny a ton on the output in order to carry this into effect. This was agreed to, and to-day the greater portion of the coal output of South Wales was voluntarily taxed to the extent he mentioned, in order to maintain technical instruction in South Wales.

Dr. GILBERT J. FOWLER (Manchester) said that in their endeavour to organize themselves they should not forget that after all organization carried to its highest point without intelligence would not take them very far.

Professor BONE said he thought we English people necessarily took a pessimistic view of our performances, our capabilities, and our prospects as an industrial nation. After all, in the ultimate analysis, we had been, and were still, the greatest and most successful nation in the world if taken per head of the population. It had been shown, and it could still be shown, that we bought more, sold more, and made more per head of the population than any other industrially organized nation. We had done this for the last fifty years, and we were not relatively losing our place. The aniline dye industry had been quoted as an instance where we had lost an industry through what was sometimes termed our incapacity to apply science to a particular industry. It was true in this particular branch. Nevertheless, he believed that if the whole output of what were termed chemicals was taken into consideration, it would be found that we were turning out as much per head of the population as the whole of Germany—a place where chemical industries were regarded as being most efficiently carried on. Again, the financial basis of our industry was very much sounder than that of Germany.

VISIT TO THE UNIVERSITY LABORATORIES, &C.

During the conference the visitors availed themselves of an invitation to visit the Manchester University Laboratories, where demonstrations were carried out by Professors Harold Dixon, F.R.S., W. J. Pope, F.R.S., and Sir Ernest Rutherford, F.R.S. They also visited various corporation undertakings, in Manchester and Salford, besides inspecting some well-known Manchester engineering establishments.

The PRESIDENT (Professor Henderson) said he was sure the members would, in traditional manner, express their best thanks to the readers of the papers.

This was carried by acclamation, and the proceedings closed.

Advisory Council on Munitions.—An Advisory Council (who held their first meeting a week ago) have been appointed to assist the Ministry of Munitions with reference to matters affecting munitions of war, the employment of workmen, the enrolment of volunteers and their transference to other districts, and the classification and co-ordination of all the various workers connected with industries where munitions of war have to be produced. The members of the Council include Sir John Aird, Mr. W. H. Cowan, M.P. (of Messrs. Parkinson and W. & B. Cowan), Mr. Alexander Duckham (brother to Mr. A. M'D. Duckham, of Westminster), and Sir G. C. Marks, M.P. (Messrs. Marks and Clerk).

Commercial Intelligence Committee.—At a meeting last Tuesday of the Advisory Committee to the Board of Trade on Commercial Intelligence, it was reported that the number of written and personal inquiries received at the Commercial Intelligence Branch in the first half of this year was 28,500, as compared with 9400 in the corresponding period of 1914; while the number of firms on the Special Register at the end of June was 3128, against 1645 at the same date last year. Reports were presented to the Committee on the series of exchange meetings instituted by the Board of Trade to bring to the notice of British manufacturers samples of goods formerly supplied by enemy countries to the United Kingdom and neutral markets, and on the British Industries Fair held in May. The Committee approved the decision of the Board of Trade to organize a second fair next year.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas-Mantles Made in Holland.

SIR,—In connection with the correspondence of the Manager of the Volker Lighting Corporation, Limited, in the issue of the "JOURNAL" for the 6th inst., it may be of interest to your readers to learn that at the beginning of the war, when several Dutch mantle manufacturing works were started, one of these was also erected in the immediate vicinity of our Western Gas-Works, and has been working ever since. This factory consumes weekly between 2400 and 2500 cubic metres of Amsterdam gas, which means that this single manufactory has a yearly consumption of more than 4 million cubic feet of gas. Of course, this is but a trifling part of the hundreds of millions of cubic feet of gas accounted for in Amsterdam.

As to the shortage in gas coals, I can only say that up to the present time, in Amsterdam as in other large Dutch towns, no special measures have been taken to limit the delivery of gas to private consumers. Gas coals, however, are scarce and dear—more licences being desirable.

Then we come to the question of the Ramie yarn. Ramie is a fibre, cultivated and produced in the Dutch East Indies—more specially on Sumatra and Java. The fibre is, however, spun to yarns in our own Dutch spinning mills.

J. VAN ROSSUM DU CHATTELL,
General Manager of the Amsterdam Gas Department.

Amsterdam, July 13, 1915.

Trench Work.

SIR,—I have naturally read with interest the "Editorial" in your issue of the 13th inst., on the paper presented by me at the annual meeting of the Institution of Municipal and County Engineers.

You are quite correct in your statement that I set out to consider how best the relations of pipe-owners and road authorities can be improved. I did this because I think that there is room for improvement, which thought is amply borne out by the remarks contained in your "Editorial." My paper was prepared without bias in favour of either "road makers" or "road breakers;" and it put forward, briefly, certain suggestions as to remedies.

An Act of Parliament is one thing and actual requirements are another, and in many instances quite different. The fact remains that statutory companies and others on the one hand have certain restrictive rights to open highways and reinstate and maintain the portion disturbed, while on the other hand road authorities have their duties to perform. If it is possible to remove the need, as you put it, of "additional powers of regulation and charges in connection with pipe work—most of them unduly burdensome, inequitable, and altogether unnecessary"— then by all means do so, but with due consideration for both sides.

One is delighted to hear that owners of subterranean pipes are quite willing to enter into any arrangements with the road authorities; and of this—as stated in my paper—I am quite convinced. There should be no difficulty as to the arrangements being to the mutual advantage of both, without any additional expense being put upon either. But both of them must agree on the course of action to be followed, if satisfactory results are to be attained. Companies supply products for (among other things) the benefit of the public; and as they are also large ratepayers, they share the burden of the cost of the highways. But I think they will agree that no body of persons should be permitted to do something which, by reason of doing it, would entail greater expense upon, and inconvenience to, the ratepayers generally; neither, on the other hand, should the demands of the road authorities be greater than the persons interfering with the highways ought, within reason, to comply with at the expense of a particular undertaking supplying the wants, it may be, of a particular few or many.

I am afraid that a letter would be too lengthy a method of explaining, in detail, the force and effect of my suggested remedies; but if of interest to your readers, as appears from your "Editorial," I shall be pleased to return to the matter in another issue.

REGINALD BROWN,
M.Inst.C.E., M.I.Mech.E., F.S.I.,
M.Inst.M.&C.E., F.R.San.I.

Old Queen Street, Westminster, S.W., July 14, 1915.

[After a long parliamentary experience of the requirements of some road authorities in connection with the laying, and the alteration of the position, of gas and water pipes, and of the bland and cool assumption that all attendant expenses whatever these requirements, whatever their cause, however unreasonable or arbitrary, should be borne by the pipe owners, it is refreshing to have Mr. Reginald Brown's letter, which expresses his conviction that arrangements between the parties could be made which would be to mutual benefit, without any additional expense to one or the other. We should be pleased to have Mr. Brown's ideas elaborated in the form of an article, because this is a matter of the utmost importance to the owners of distribution systems for such public services as the supply of gas and water. Although our correspondent refers to "mutual advantage" and "additional expense" in the next passage, the following statement, standing alone, does not completely represent a point which we made last week: "One is delighted to hear that owners of subterranean pipes are quite willing to enter into any arrangements with the road authorities." Our statement, with the qualifications, was: "Let us preface comment with the remark that the owners of subterranean pipes are quite willing to enter into any arrangements with the road authorities which will be to their mutual advantage, but would strongly resent additional expense being put upon them—that is, expense beyond what they at present incur—unless it is shown they are going to derive compensatory advantage from it." Mr. Brown has not evaded the qualifications; but he disjoints them from the original context, and so somewhat alters the complexion of our statement.—Ed. J.G.L.]

Meter Rents in the South Suburban District.

Sir,—*A propos* the article on meter-rentals in the South Suburban Company's district, is it not a fact that in the Company's original district a uniform rental for all sizes of meters has been in force for many years past? Otherwise the rental we have paid here for ten years for a 20-light meter is unusually low—9d. a quarter. In Westminster, a 20-light meter costs 2s. a quarter; and a 10-light one, 1s. 3d.

I imagine that many consumers will hold their hands and force the Company, if they wish to charge 1s. 6d. a quarter, to give a quarter's notice to terminate the existing agreement. In order to save the trouble and expense of preparing new agreements, the Company may ask consumers to sign an undertaking to agree to this alteration of the old terms as from the termination of the quarter's notice.

This procedure is being followed by the Westminster Electric Supply Corporation, which has sent with the accounts for last quarter a notice that it has found it necessary—on account of dear coal—to increase the charges for electricity by 10 per cent. [Whether the increase applies to meter-rents as well as current per unit is doubtful.] It therefore gives formal notice that at the end of three calendar months the existing agreement will terminate, and asks consumers to sign and return, within fourteen days, an undertaking to pay after the expiration of three months an increased charge of 10 per cent. on the prices fixed in the agreement.

Norwood.

July 17, 1915.

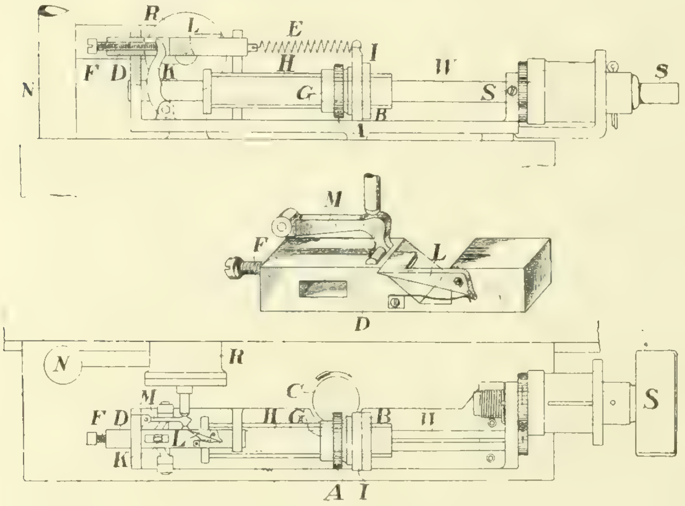
REGISTER OF PATENTS.

Prepayment Gas-Meters.

Julius Pintsch, of Vienna.

No. 2652; Feb. 2, 1914. Convention date Feb. 1, 1913.

This invention relates more particularly to that type of coin-freed meter in which the opening of the valve for controlling the flow of the gas is effected by the setting or adjustment of a quantity mechanism and the closing of the valve is automatically effected, partially by the action of the meter and then completely and rapidly by a device operating independently of it. The gas-valve is held in its open position against the action of a spring or weight by a lever pivoted in the frame until one end of the lever bearing against a slide is shifted at the end of the gas delivery period—being lifted out of the recess on inserting a coin and moving back the slide.



Julius Pintsch's Prepayment Meter.

An elevation and plan of an embodiment of the invention are given; also a perspective view of a detail.

The coin-actuated device (of well-known construction) operates in the usual manner. By turning the key S a shaft W is turned through the medium of pinions, which may be removed and replaced by others. Lengthwise movement of the shaft is prevented by a collar or circumferential groove on it and a pin engaging with it. A sleeve H (having cut upon it a screw-thread of predetermined pitch) is adapted to slide lengthwise on the shaft, and is provided with an inwardly projecting pin engaging into a longitudinal groove in the shaft so that the sleeve revolves together with the shaft, but may also move lengthwise of it. G is a sleeve provided with an internal thread fitting the screw thread on the sleeve H and with a worm wheel A on its outside. The sleeve is prevented from moving lengthwise by a flange B engaging with the bearing I, but is free to turn. A worm C, driven by the meter drum, meshes with the worm wheel A.

As the sleeve H is turned, together with the shaft W, while the sleeve G is prevented from turning by the worm wheel engaging into the worm C, the sleeve H must screw into the sleeve G moving longitudinally towards the coin insertion, and through a distance corresponding to the number of coins inserted. The worm C, driven by the meter drum, drives, in turn, the sleeve G through the medium of the worm wheel A, causing the sleeve H to move longitudinally in the opposite direction—that is to say, towards the valve V; and in this return movement, and before reaching the end of its course, the sleeve H causes the valve to close. This method, and the devices required therefor, form the object of the present invention.

In two standards at the valve end of the frame a slide D is mounted and acted upon by a coiled spring E, tending to draw the slide towards the coin-insertion end of the device. An arm K, pivoted in the frame and adapted to be adjusted by a screw, engages into a slot of the slide. The sleeve H, on being moved towards the left, turns this arm, and therefore also moves towards the left the slide D against the action of the spring E. In the slide D a wedge-shaped recess is provided which is partly covered by a spring-actuated finger pivoted to the slide. One end of a lever M pivoted in the frame bears against the slide D. The gas flows through the usual supply pipe N to the valve casing, and thence (when the valve is open) to the meter drum. The valve is provided with a spring tending to close it; and the valve spindle abuts against the lever M.

When the slide D is moved towards the left by the sleeve H and the arm K, one end of the lever M first slides along the slide and then, with a lateral projection, over the part of the finger L covering the wedge-shaped recess of the slide D, and is finally forced into the recess by the valve spring. The valve is thus closed and the apparatus stopped. If, now, a coin is inserted, and the sleeve H is pushed back, the lever K is released and the spring E draws the slide towards the right, the end of the lever M slides upwards along the inclined side of the wedge-shaped recess, and the projection lifts the finger L, whereupon the finger again closes on the wedge-shaped recess after the lever M has returned to its normal position—the valve being opened again. Thus the valve is closed suddenly, and when closed it is no more dependent of the automatic device. But by inclining the upper face of the finger L, a closing movement may be imparted to the valve which is at first gradual, whereby the consumer becomes aware that the gas delivery is about to be shut off. By adjusting the screw F the moment of the complete closing of the valve may be adjusted.

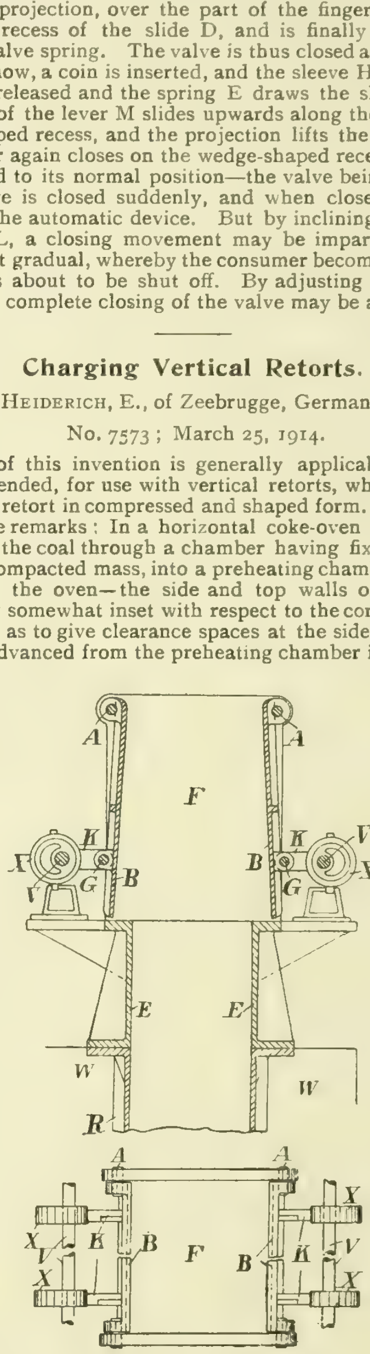
Charging Vertical Retorts.

Heiderich, E., of Zeebrugge, Germany.

No. 7573; March 25, 1914.

The object of this invention is generally applicable, but is more specifically intended, for use with vertical retorts, which is to supply the coal to the retort in compressed and shaped form.

The patentee remarks: In a horizontal coke-oven it has been proposed to force the coal through a chamber having fixed tapered walls to produce a compacted mass, into a preheating chamber by a plunger, and thence to the oven—the side and top walls of the preheating chamber being somewhat inset with respect to the corresponding walls of the oven, so as to give clearance spaces at the sides and top of the mass of coal advanced from the preheating chamber into the oven.



Heiderich's Vertical Retort Charger.

According to the present invention, the filling hopper is provided with movable side walls, which, in their motion compress the fuel and shape it into a form corresponding substantially to the cross section of the retort—like a briquette or cake, the cross-section of which, although corresponding in shape to the retort, is preferably slightly less than the cross sectional area of the retort, so as to allow for expansion. The shape of the side walls, which are movable, depends upon the shape of the retort, and they "are preferably arranged to exercise an increasing amount of side pressure on the body of the fuel descending through the hopper into the filling spout of the retort," by a "suitable inclination or tapering of the walls." The progressive application of side pressure is said to have the effect of "producing a relatively firm and cohesive block with smooth side surfaces, and with an internal structure which is not readily disturbed or broken up by the increasing heat owing to the expulsion of the bulk of the air from between the interstices of the fuel."

The illustration shows a section through the filling spout and feed hopper according to the present invention, and a plan of the device as applied to a vertical retort of rectangular cross section.

The retort walls are indicated at W. A space R is left between the retort walls and the filling piece E for the outlet of gas. On the top of the filling piece are provided ledges to support bearings for two transverse shafts V, which have mounted on them eccentrics X connected by links K to movable side walls B of the filling hopper F. The links are pivotally connected at G to the movable side walls.

In the form illustrated, the movement of the side walls is an oscillating movement about centres or pivots A, arranged at the upper end; while the connections from the eccentrics X are located near the lower ends of the walls B. By means of this device the amount of lateral movement of the walls (which, of course, determines the degree of side pressure applied to the fuel) increases as the fuel moves downwards away from the centre of oscillation A. The amount of side movement, and consequently the amount of side pressure, applied is, therefore, a gradually increasing one; so that the air in the interstices between the particles of fuel is expelled, and the fuel (before its entry into the filler E and retort W) is brought into the form of a more or less cohesive block.

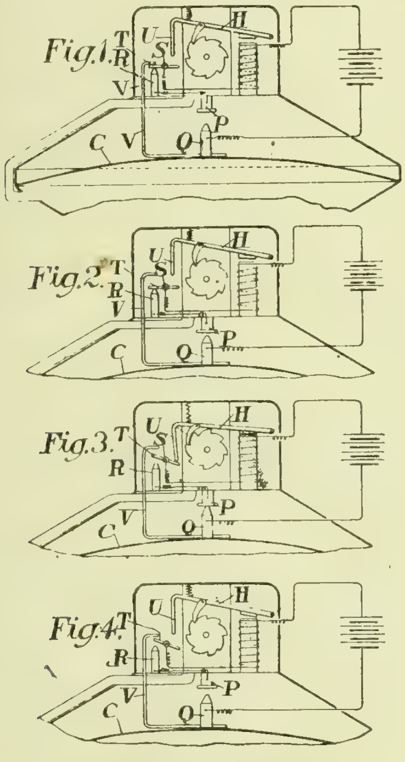
With retorts working continuously, a continuous block would be formed "which has an advantageous effect on the distillation, owing to the uniformity obtained." In horizontal or inclined retorts the device is arranged in front of the filling hopper.

Lighting Gas-Lamps from a Distance.

Westf. Gasglühlichtfabrik F.W. and Killing, C., of Hagen, i.W.-Delstern, Germany.

No. 7798; March 27, 1914. Convention date, May 9, 1913.

This invention relates to devices for lighting gas-lamps from a distance, in which the gas-cock is opened and closed by an electro-magnet, the circuit of which is closed as the result of a temporary rise in pressure in the gas-main.



Killing's Pressure Lamp Lighter.

One example of the apparatus is diagrammatically represented "in its essential parts and in various positions of operation."

Fig. 1 illustrates the device in its normal position—*i.e.*, with normal gas pressure and the diaphragm in its lowest position. The contact device R S is closed, and the circuit is open at P Q. When it is desired to light or extinguish the lamp by turning the gas-cock, the gas pressure is increased; and consequently the diaphragm C rises, the contact pin Q approaches the plate P, and the bent member V allows a free path for the contact lever S (fig. 2). When the pressure has risen to such an extent that the two contact pieces P Q touch one another, the circuit of the electro-magnet is immediately closed; and, by means of the latter, the actuating lever H (fig. 3) is attracted downwards with simultaneous rotation of the gas-cock. When the lever H moves downwards, its downwardly bent end U strikes against the rear end of the contact lever T, and consequently opens the circuit of the electro-magnet. The contact lever T tends, in virtue of its own friction, to remain in the slanting position, so that at this place the circuit is held open during the downward movement of the membrane, and which movement starts only gradually. Any subsequent undesired contacts made by the contact-pieces P Q are thus altogether without effect. Only when the diaphragm, as shown in fig. 4, has moved so far down that undesired contact between the contact-pieces P Q is impossible, is the contact lever T of the auxiliary switch pulled down by the bent member V, owing to the further downward movement of the diaphragm—the contact lever being thus returned to the normal position as shown in fig. 1, and the auxiliary contact device being in consequence again closed.

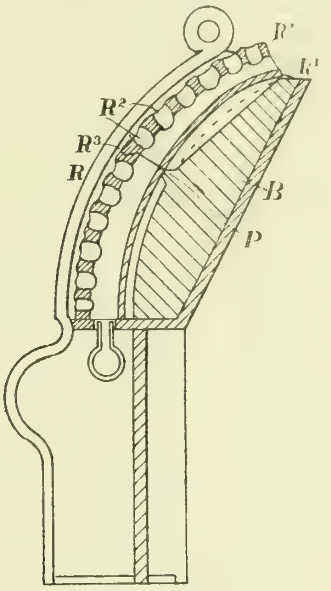
Gas-Fires.

Wilson, W. A., of Armley, near Leeds.

No. 15,978; July 4, 1914.

The object of this invention is "to construct a gas-fire specially adapted for standing on the hearth and fitting into fireplaces or well-grates and occupying the same position, and to a great extent giving a contour and appearance similar to a coal-fire—said gas-fire, in addition, having a high radiant efficiency."

The patentee says that in carrying his invention into effect he first made a number of experiments to find out the lowest curve which a preferably well-aërated flame would take when burning in the vicinity of a solid body, and afterwards determined the increased effect of a tubular construction placed around the flame. In this way, he found what was the correct lowest curve to construct the gas-fire according to his invention.



Wilson's Gas-Fire.

In one form he surrounds a flame, or series of flames, with a fire-clay or like tubular radiant or radiants having open fronts R^2 and substantially solid backs R^1; the backs deing shaped first in the same direction as the initial direction of the flame and then gradually curved backwards—becoming more horizontally inclined towards the top. On the front or inner surface of the back of the radiants there are formed small ribs, nipples, or like projections (such as have hitherto been proposed) so made as not to interfere with the attraction of the flame towards a solid surface, or the flue-like action of the radiants. Behind these radiants is placed a fire-brick or other back B, to prevent loss of heat behind the fire—such back being kept a distance away from the radiant by projections P on which the radiant can be supported. The space thus formed between the fire-brick back and the radiants prevents loss of heat by conduction.

In another form the invention comprises a flame, or series of flames, arranged with a fire-brick back B shaped as the solid back of radiants (as previously described) and having a fire-clay open-fronted channel radiant or series of radiants—that is, radiants without backs—arranged to fit or lay on to the front of the fire-brick and give the formation described with reference to the first form.

In making radiants for any of the fires described, a number of tubes may be formed joined together and an upper set rest on a lower—a suitable joint being formed, as at R^3. With a properly-constructed radiant there is said to be no escape of flame through the front of the radiants, which become heated internally throughout their length. Such a fire, being of a less height than the general type of gas-fire, is intended to fit into a well or coal grate and give the appearance of a deep fire. The radiants are disposed in relation to the flame in such a way that they "in no way impede or check the flame, and so do not interfere with efficient or complete combustion."

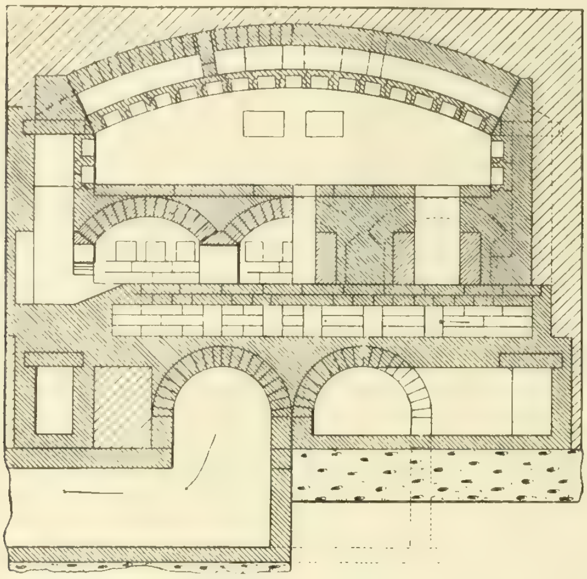
Gas-Heated Annealing Furnaces.

Gibbons Bros., Limited, Masters, R., and Van Marle, M., of Lower Gornal, Staffs.

No. 18,346; Aug. 7, 1914.

This invention has reference to gas-heated convertible furnaces for annealing metals—of the kind which is arranged so that the same furnace can be used either for close annealing with the flames passing around the annealing chamber or for open annealing with the flames passing through the annealing chamber.

According to the invention, one or more longitudinal combustion chambers receiving gas and heated secondary air are provided (underneath the annealing chamber) in which the combustion of the gas and secondary air takes place. The combustion chambers have two sets of outlet heat flues or passages; one set leading to the interior of the annealing chamber near the front end, and the other set leading up and along heat flues at the side of the annealing chamber over and through the hollow arched top of it. The outlet passages are controlled by dampers, which can be so manipulated as to cause the heat to either enter the annealing chamber and travel through it and through outlets at the back when used as an in-fired annealing furnace, or, when the dampers are closed, other dampers are opened and the heat can pass through the other passages and side flues and through the hollow



Gibbons, Masters, and Van Marle's Gas-Heated Annealing Furnaces.

arched top of the annealing chamber for close annealing. From the back of the hollow arch of the annealing chamber, and from the back of the interior of the annealing chamber, there are outlet passages separately controlled by dampers and leading to flues connected with waste-heat flues leading to the main flue to the stack. The secondary air is heated by passing through tortuous passages underneath the combustion chambers. Thus, by merely opening or closing the necessary dampers, the heat can be caused either to enter and pass through the annealing chamber, or, for close annealing, to pass up and along the hollow sides and through the hollow arched top of the annealing chamber.

The annealing furnace combined with a gas-producer is by preference constructed and arranged as shown in cross sectional elevation.

Rotary Gas-Engines.

Morgan, C. W., of Racine, Wisconsin, U.S.A.

No. 19,640; Sept. 10, 1914.

The object of this invention is to provide a "simple, economical, and highly efficient" valveless gas-engine of the type wherein a rotor works within a cylindrical shell and is provided with means whereby a combustion charge is induced into a chamber formed between the rotor and the interior wall of the cylindrical shell and is then compressed into a combustion chamber or gas pocket formed in the periphery of the rotor.

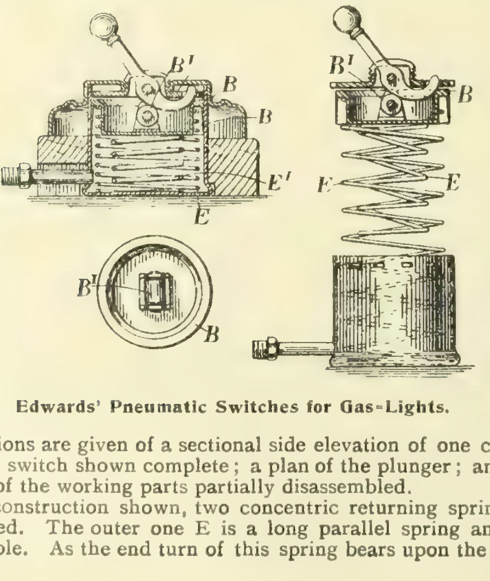
Hitherto in such apparatus the power impulse due to the firing of the compressed charge has been taken upon outwardly sliding vanes; and it is said to be an important feature of the invention that pivoted or hinged pistons or explosion vanes are employed. A further important feature consists in the provision of means whereby the combustible supply is introduced into the receiving chamber from a centrally situated head to which the combustible charge is supplied by means of a supply pipe or the like.

Pneumatic Switches for Operating Gas-Valves.

Edwards, A. N., of Farringdon Street, E.C.

No. 20,894; Oct. 12, 1914.

This invention relates to pneumatic switches for operating gas-valves from a distance, of the type in which there is a spring-returned plunger working in a barrel and driven inwards by a cam usually operated by a tumbler-lever.



Edwards' Pneumatic Switches for Gas-Lights.

Illustrations are given of a sectional side elevation of one construction of the switch shown complete; a plan of the plunger; and a side elevation of the working parts partially disassembled.

In the construction shown, two concentric returning springs E E^1 are provided. The outer one E is a long parallel spring and easily compressible. As the end turn of this spring bears upon the plunger B near its periphery, it assists in preventing the jamming of the plunger. The short inner spring E^1 (stiffer than the other spring) is secured at one end to the plunger; while the other end bears against the bottom of the barrel, on which it is maintained concentric by a slightly raised portion. The spring is of such length as not to be appreciably compressed when the plunger is in its outermost position; and therefore it does not appreciably oppose the initial part of the inward movement of the plunger. In order to obviate any tendency of the springs to cause the piston to work round in the cylinder, so that the cam-roll B^1 is not square with the cam, the two springs are coiled in opposite directions.

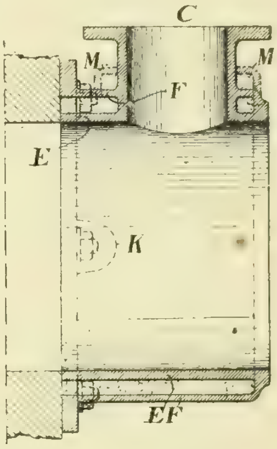
The plunger is specially formed with a central recess to receive the cam-roll or butting-piece, and an annular recess in the other face to receive the long parallel spring E. The recesses are constituted by an upstanding rim of inverted U-shape. The parallel springs will not collapse so flat as the conical spring previously used, but the annular recess provides space to receive the spring when compressed without rendering the switch bulky.

Retort Mouthpieces.

Nübling, R., of Stuttgart, Germany.

No. 23,542; Dec. 4, 1914. Convention date, Jan. 23, 1914.

In the mouthpiece of gas-retorts, the patentee notes, the gases coming from the retort are cooled considerably before they pass to the outlet pipe, owing to radiation of heat by the mouthpiece, which is "more particularly disadvantageous as the cooling produces a diminution of pressure, and consequently air is liable to be drawn in through leaky points at the seat of the retort cover." Recognizing that it is very important to have protection from heat just at the gas outlet point, a heat-insulating packing is suggested by the patentee by making the mouthpiece with double walls—the heat-insulating or non-conducting mass being rammed into the hollow spaces. In doing this, "it has been taken into account that the non-conducting mass, once filled in, must be permanently protected from mechanical injuries and effects of working, by making the hollow spaces for the non-conducting mass accessible only from the flange side adjoining the front wall of the retort."



Nübling's Retort Mouthpiece.

The mouthpiece shown is secured to the front end of the retort (as shown) by means of nuts. It is provided with a gas discharge branch C, and double walls E F, the hollow space formed by which is filled with a non-conducting packing—for instance, with "kieselguhr"—rammed in through the core holes of the flange. The holes are also filled with the heat-insulating mass, and are closed air-tight by a layer of cement between the retort and the flange. The inner space of the mouthpiece is thus protected by the packing from excessive cooling, and at the same time "the injurious radiation of heat near the mouthpiece is reduced as far as possible." The two walls meet at the point where the fixing screws are arranged, in such a manner as to produce recesses K for the mouth of the spanner for tightening or loosening the fixing nuts.

As shown, the outer walls F could also be provided, at the point where the branch C passes through the walls, with a hollow annular projection M surrounding the branch and filled with the non-conducting mass, in order also to reduce as far as possible the heat radiation of the branch.

APPLICATIONS FOR LETTERS PATENT.

9757.—Keith, J. & G., "Rotary blowers." July 5.

9780.—Ciselet, E., and Deguide, C., "Purification of gas." July 5.

9905.—Hunter, C. M., "Gas-burners." July 7.

9908.—Neuland, A. H., "Lighting and ignition systems." July 7.

9911.—Fisher, J., and Fiddes, W. J., "Removing matter from gas." July 7.

9946.—Keith, J. & G., "High-pressure gas lighting." July 8.

9988.—Hall, L., "Burning gas." July 9.

10,022.—Lessing, R., "Extraction and recovery of vaporous constituents from coal gas." July 9.

10,058.—Gibbons Bros., Ltd., and Masters, E., "Discharging retorts." July 10.

10,066.—Moss, G. L., and the Simon-Carves Bye-Product Coke-Oven Construction and Working Company, Ltd., "Purification of benzol." July 10.

10,074.—Etna Lighting and Heating Company, Ltd., and Prosser, H. R., "Bunsen burners." July 10.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress has been made with Bills:—

Bills reported, with amendments: Gas and Water Provisional Orders (Nos. 1, 2, and 3), Metropolitan Water, Rhondda Urban District Council, Weardale and Consett Water.

Bills read the third time and passed: Barnoldswick Water, Southend Water.

Bills Royal Assented: Chelmsford Gas, Irvine and District Water, Kilmarnock Gas, Lurgan Urban District Council, Northwich Gas, Prescot Gas, Skegness Gas, Spennymoor and Tudhoe Gas, Sutton Water.

The Glasgow Corporation Bill was brought from the Commons, read the first time, and deemed to have been read a second time and reported from the Committee.

The Durham County Council have deposited a petition against the Weardale and Consett Water Bill.

HOUSE OF COMMONS.

The following progress has been made with Bills:—

Bill read a second time: Irvine and District Water.

The Northwich Gas Bill [Lords] and the Sutton Water Bill were read the third time and passed with amendments.

The Glasgow Corporation Bill and the Irvine and District Water Board Bill were read the third time and passed without amendment.

The House was informed that the Lords had agreed to the Barnoldswick Water Bill and the Southend Water Bill with amendments; the Northwich Gas Bill without amendment.

PRICE OF COAL (LIMITATION) BILL.

The following Bill, to provide for the limitation of the price of coal, was presented by Mr. Runciman [supported by Mr. Pretyman] in the House of Commons last Tuesday.

1.—(1) Coal at the pit's mouth shall not be sold or offered for sale by the owner of the coal, or on his behalf, at a price exceeding by more than the standard amount per ton the price of coal of the same description, sold in similar quantities, and under similar conditions, at the pit's mouth at the same coal mine on the corresponding date (or as near thereto as, having regard to the course of business, may be practicable) in the twelve months ended the 30th day of June, 1914 (in this Act referred to as the corresponding price).

(2) The standard amount shall be 4s., provided that the Board of Trade may, by order, if they are satisfied, as respects any class of coal mines specified in the order or the coal mines in any district so specified, that, owing to special circumstances affecting those mines, the standard amount of 4s. should be increased, substitute for that amount such higher sum as they may think just in the circumstances; and as respects those mines, this Act shall have effect as if the higher sum so substituted were the standard amount.

(3) If any person sells or offers for sale any coal in contravention of this section, he shall be liable, on summary conviction, to a fine not exceeding £100 or, at the discretion of the court, to a fine not exceeding treble the amount by which the sum paid, or payable, for any coal sold by him in contravention of this section exceeds the maximum sum which would have been paid, or payable, for the coal if there had been no contravention of this section.

(4) This section shall apply to a case where the owner of coal at the pit's mouth has sold, or offered to sell, that coal at a price which includes the cost of railway or other incidental services besides the actual value of the coal at the pit's mouth, as if he had sold, or offered to sell, at the pit's mouth at a price reduced by an amount representing the cost of those services.

2.—(1) If in any proceedings for the recovery of a fine under this Act any question is raised as to the corresponding price of any coal (including any question as to the cost of railway or other incidental services), the Court shall refer the question for determination by the Board of Trade; and the decision of the Board shall be final and conclusive for all purposes.

(2) If for any reason there are not adequate data at any coal mine from which to ascertain, in accordance with the foregoing provisions of this Act, the corresponding price at that mine, the Board of Trade may fix that price having regard to data afforded from sales of coal at other mines.

(3) The Board of Trade may require the owner of any coal mine to furnish such information as appears to them necessary for the purpose of carrying into effect this Act; and if any person refuses to furnish any such information when so required, or furnishes information which is false in any material particular, he shall be liable on summary conviction to a fine not exceeding £100.

(4) The Board of Trade Arbitrations, &c., Act, 1874, shall apply as if this Act were a Special Act within the meaning of the first-mentioned Act.

3.—(1) This Act shall not apply to any sale of coal for export, or to any sale of coal for the manufacture of patent fuel for export, or to any sale of coal to be used on any ship.

(2) This Act shall not apply to the sale of coal supplied in pursuance of a contract made before the commencement of this Act.

(3) This Act may be cited as the Price of Coal (Limitation) Act, 1915.

(4) This Act shall have effect during the continuance of the present war and a period of six months thereafter.

LINCOLN CORPORATION BILL.

This Bill was last Wednesday sent forward for third reading by the Unopposed Bills Committee of the House of Lords. The gas clauses were set out when the Bill was before the Local Legislation Committee of the House of Commons. [See "JOURNAL," May 11, p. 340.]

SOUTHAMPTON ELECTRIC LIGHTING ORDER.

"Northumberland Clause" Granted.

HOUSE OF LORDS COMMITTEE.—Thursday, July 15.

(*Before Viscount* BRISTOL, *Chairman, Lord* BARRYMORE, *Viscount* FALKLAND, *the* EARL OF MAYO, *and Lord* BATEMAN.)

This Order, which is contained in the Electric Lighting Provisional Orders Confirmation Bill No. 3, deals with an extension of the Southampton Corporation electric supply area. The proceedings in the House of Commons were fully reported in the "JOURNAL" for June 29, p. 763.

Counsel for the Corporation were Mr. VESEY KNOX, K.C., and Mr. TYLDESLEY JONES. The opponents, the Southampton Gaslight Company, were this time represented by Mr. HONORATUS LLOYD, K.C., and Mr. A. M. PADDON.

Mr. VESEY KNOX stated the object of the Order in much the same terms as when the Bill was before the House of Commons. Briefly, the Corporation seek to add to their electric lighting area the district of Bitterne; and the Gas Company asked that the "Northumberland Clause" should be applied to the whole of the Southampton electric supply area. Complaint was again made that the Gas Company should have pursued the Corporation from the Board of Trade to the House of Commons and now to the House of Lords; Counsel submitting that the only reason for the opposition could be because the Corporation electrical undertaking had now become such a serious competitor with the Gas Company that the latter desired to hamper the Corporation in every possible way. Furthermore, the Company was a maximum-price concern, and well able to pay their maximum dividends. So that the cost of this opposition would fall upon the consumers of gas in Southampton, and not upon the shareholders, as would be the case if the Company were under the sliding-scale. The object, effect, and history of the Northumberland clause was then fully explained to the Committee. It was argued that while the clause might be perfectly reasonable in the case of small undertakings, it was both mischievous and annoying in the case of large industrial towns such as Southampton, and, indeed, practically unworkable if imposed. The main argument against the clause in large towns was that it interfered with the making of long-term power contracts, inasmuch as the clause provided that when at any triennial revision the price to "ordinary" consumers was increased, in order to prevent any loss upon the undertaking, the price for power should be proportionately increased. The Company took it that "ordinary" consumers meant lighting consumers; and upon this basis it would be seen how absurd the clause was. With lighting consumers, the chief cost was distribution, and it might be fair and reasonable, if (say) the half-watt lamp was developed so that it could be used for ordinary houses in small sizes, to increase the lighting charge because the consumption of current for the same amount of light would be halved. This consideration did not apply to power. Yet, under the clause, the power charges were to be increased in proportion to the increase in the lighting charge. This made it practically impossible to enter into large power contracts. As a matter of fact, only one large town had attempted to work the clause, and that was Huddersfield. But they were now having considerable trouble with their power contracts. At Southampton, one large power contract had been entered into with the Pirelli General Cable Works, and it was hoped to introduce other industries into the town. This, however, could not be done if manufacturers were asked to bind themselves to take current for a long period of years, leaving the Corporation free to vary the price every three years. The clause was not in operation in very many places—in fact, most of the recent new undertakings upon which it had been imposed had never started operations. The Board of Trade had refused to grant the clause in this case, and he asked the Committee to support their view, on the ground that the Southampton electrical undertaking was so flourishing that it would unduly hamper the Corporation in making large power contracts.

Sir *John Snell* gave evidence in support.

In cross-examination by Mr. HONORATUS LLOYD, witness mentioned that whereas he was at one time in favour of the clause, he had changed his opinion since he had had to study the practical effect and advise a leading gas company in relation to an endeavour to put the clause into effect in a London borough. The electrical undertaking in question was making a loss, and the conclusion he had now come to was that if the clause were enforced the loss would be greater, and the position of the Gas Company, as ratepayers, would be worse than ever. Counsel put to witness several instances of large towns where the clause had been inserted; but he said he was not aware of the fact. He was not prepared to accept the clause for Bitterne only.

This closed the case for the Corporation.

Mr. HONORATUS LLOYD, who did not call evidence, addressed the Committee. The position, he said, was that the Southampton Corporation, having been permitted to work an electrical trading undertaking in the borough, now sought to go outside the town. Parliament had hitherto said, after considering the matter for years and years, that if corporations were to be allowed to set up trading undertakings they should do so upon fair terms. From the very early days there had been, and still was, the keenest competition between electrical and gas undertakings. If the latter had not been able to turn their utility into fresh channels, probably they would have gone under; but they had maintained their own successfully to the benefit of the public. It must be borne in mind that municipalities had the ratepayers at their backs, and the whole security of the rates, and therefore it was possible for a municipal electrical undertaking to be carried on upon vastly different lines to a commercial undertaking in the hands of a company. It was thought in 1902, when the clause was first inserted in an Electric Lighting Order, and was known as the "Bermondsey" clause, that this was a solution of the difficulty. In the year 1903, it came before Parliament again, and was put into several Orders, including one for an extension to the Brighton supply area—the clause applying to the added area only. Sir John Snell would not even accept the clause in this form. Why, he could not understand, because the main objection seemed to be on the ground that it would interfere with power contracts, and it was not suggested that such contracts could be obtained in Bitterne. By the decisions in 1903, the gas industry thought it really had got the protection of Parliament; but in 1904 the matter came to a crisis. In that year there were two Bills relating to Leyton (Essex) and Swindon in which the House of Commons refused to insert the clause; but the House of Lords insisted, and the clause went in both Bills. It also went into eleven Provisional Orders. Therefore in 1904 Parliament had made it clear that the practice was to be uniform. But it did not stop there, for in 1905 there were a number of Orders in which the clause was inserted, either by agreement or by Parliament, because the Board of Trade were refusing to insert the clause at the time. In 1907, gas companies came to Parliament again and again and secured this protection; and in the year 1908 came the Llansamlet Order. By this time the Board of Trade were apparently convinced that Parliament intended that the clause should go in; and from that time until now, the Board had inserted the clause in all Orders where it was asked for by gas companies. The first exception was the present Order. It had been said that the clause should not be inserted because the Southampton undertaking was in a flourishing state. But was it not because, as late as 1904, some members of the Corporation were not satisfied with the policy of the undertaking that Sir John Snell was called in to report? In this report Sir John recommended a depreciation and renewals fund, and pointed out that too much was being charged for current for tramways and too little for public lighting. He also stated that there was no real reason for reducing the charge for private lighting from 3½d. to 3d. per unit. Why, then, was the reduction made? The report showed that the concern had not been carried on upon the best lines. Reference had been made to the Pirelli contract. But this did not contain a coal clause, and Sir John Snell did not approve of it. It meant that the price to be paid to the Corporation was a fixed one whatever the cost of coal. He regarded this as an improvident contract; and gas companies invariably in making such long contracts provided that the price should slide in proportion to the cost of coal. The Corporation had not only made the mistakes mentioned in Sir John Snell's report, but, in embarking upon the power business, had perpetrated an initial blunder which made it very necessary for the Gas Company to get the protection which had been given by Parliament so uniformly hitherto. As to the demand in Bitterne, no one had been called from the district to say a supply was wanted; and he suggested that the Gas Company were entitled to protection in one of three ways—by the application of the Northumberland clause to the whole of the electrical undertaking, or to Bitterne only, or to the whole of the undertaking, with the proviso that it should not apply to large power contracts.

The CHAIRMAN, at the close of Counsel's speech, said he had sent for a representative of the Board, of Trade, in order to ascertain why the clause had been refused in this instance.

Mr. M. J. COLLINS of the Board of Trade subsequently attended.

The CHAIRMAN: What are the reasons which actuated the Board of Trade in this case?

Mr. COLLINS: Since 1904 the Board have decided to insert the clause in every Provisional Order granted to a local authority where the clause was asked for by an opponent, except in exceptional cases where the Board thought the clause unnecessary. We insert it in all cases, but keep it to ourselves not to insert it if we think there is no necessity for it. I think we have inserted it in every case since 1904 except in the present case. We had a meeting at the Board of Trade between the promoters and the Gas Company. It was represented to us that the promoters would only spend £400 on the work; and as the profits of the undertaking for several years had amounted to thousands of pounds, it appeared to us that the whole undertaking could not be a sufficient loss to have to come on the rates for assistance. Even if the £400 were expended, and not one consumer was obtained, it would not affect the revenue; and we thought it rather absurd to put it in.

Was not the clause inserted as much for the protection of the gas companies as for the ratepayers?—Gas companies usually ask for the clause, except in one case in a South Wales mining district, where a mining company who were very large ratepayers asked for it.

Was not that for their protection?—Yes, to prevent the undertaking becoming a burden on the rates. In the Southampton case, however, we thought it would be impossible for it to be a burden on the rates owing to the small amount of capital expenditure.

You do not take into consideration any other point except so far as it should be a burden on the rates?—Yes.

That is the only point you take into account?—The only other point is competition. But we never take this into consideration, because gas companies invariably oppose electrical undertakings.

Have you considered whether the clause should be applicable to the whole undertaking or to the extended area only? I understand that when the Order is drawn it provides that the existing concern and the extended area are regarded as one undertaking.—The new Order and the old Orders are to be read together. It would be very difficult for the existing undertaking and the extended area to be kept separate.

The CHAIRMAN: There are cases of that sort?

Mr. VESEY KNOX: Brighton, I think, is the only case. There is Wimbledon in regard to the Maldens and Coombe. In that case the clause applies to the extended area, but only in the event of the Maldens District Council purchasing the undertaking from Wimbledon.

The room was then cleared.

The CHAIRMAN, on readmission of the parties, said: The Committee have decided that the Order should be confirmed, but that the Northumberland clause should be applied to the extended area only.

ASHINGTON URBAN COUNCIL BILL.

Consideration of this Bill [a report of the earlier proceedings in which was given in the "JOURNAL" last week on p. 85] was resumed last Tuesday. An adjournment had taken place in order that the Ashington Council might consider an offer from the Tynemouth Corporation for a supply of water in bulk, or, alternatively, for Tynemouth to take over the supply in Ashington and include it in the Tynemouth water limits.

Mr. BALFOUR BROWNE, K.C., for the Tynemouth Corporation, read certain correspondence which had taken place between the parties during the adjournment, the outcome of which was that the Ashington Council preferred that the Tynemouth Corporation should include Ashington in the Tynemouth water limits.

Mr. HONORATUS LLOYD, K.C., for the Ashington Council, said that, although the authority would infinitely prefer their own scheme, nevertheless, having regard to the Chairman's remarks, he had advised his clients to adopt a course which he believed it was his duty to do; and they had reluctantly agreed to accept the offer of the Tynemouth Corporation to supply in Ashington on the same terms and conditions as in Tynemouth.

Clauses were subsequently brought up to give effect to this agreement. The Tynemouth Corporation are to bring a Bill in the next available session of Parliament for powers to include Ashington in its water area; and if within one year of the passing of the Act the Corporation have not substantially commenced the works, or within three years are not able to supply, then the Ashington Council are to be free to go ahead with their own scheme, which is provided for in the present Bill. A reservoir with an initial capacity of 1,000,000 gallons is to be provided—this capacity to be increased to 2,000,000 gallons when the average daily consumption exceeds 400,000 gallons. It is further provided that Ashington shall not be liable for any rate-in-aid that the Tynemouth undertaking (including Ashington) may involve; and the Tynemouth Corporation are to purchase the existing mains, pipes, &c., in Ashington, and take over all obligations, other than the present debts and liabilities, of the Ashington Council in regard to the existing water undertaking.

The CHAIRMAN, at the conclusion of the proceedings, remarked that it was the feeling of the Committee that Ashington should have the favourable terms they had obtained having regard to their giving up their own scheme.

The Bill was then reported for third reading.

WEARDALE AND CONSETT WATER BILL.

This Bill was disposed of last Thursday by a House of Lords Committee presided over by Viscount BRISTOL. It has already passed the House of Commons. [See "JOURNAL," May 25, p. 462.] As on the previous occasion, the hearing extended over several days.

The scheme of the Bill is to construct a new reservoir at Burnhope, and to take water from certain springs until the reservoir is completed. An aqueduct 28 miles in length will be made. The opposition was, as before, from local authorities in the Consett area, who objected to the proposed increase of 10 per cent. in the charges, and asked that this should not apply to Consett. Further, it was urged that the Company should be put under greater compulsion than was placed upon them by the House of Commons, in order to ensure that the new reservoir is constructed.

The Committee, however, decided that Consett should not have preferential treatment in the matter of charges. With regard to the construction of the reservoir, it was decided that the new scale of charges could only come into operation after £120,000 had been spent upon commencing the works. From then until a further £200,000 have been spent, however, the Company must give a rebate of 10 per cent. off the scale. After this, the rebate will be reduced to 5 per cent. until the reservoir is finished, when the full increased scale will apply.

Tipton Gas-Works Accounts.—The statement of accounts relating to the gas undertaking of the Tipton Urban District Council, for the year ended March 31, which has been prepared by the Manager (Mr. William Prince), shows that the receipts amounted to £21,951, and the gross profit to £4873. This, after meeting interest and sinking-fund charges, was transformed into a net deficiency of £482, which has been carried to the accumulated profits account. The quantity of gas made was 153,316,000 cubic feet, compared with 149,163,000 cubic feet the previous year; and the net coal gas made per ton, 12,204 cubic feet, against 11,356 feet. Leakage, condensation, &c., figures at 11·08 per cent., compared with 9 per cent.

The British Coalite Company.—From the "Liverpool Courier:" "There are numerous concerns, hitherto in very low water, which have reason to bless the war for giving them a chance to recover their footing. One of these is the British Coalite Company, whose shares at the beginning of the present year went begging at 1s. apiece, but now cannot be bought under 12s. Not only has the issue of capital required for the formation of the subsidiary Company—the Barnsley Smokeless Fuel Company—been sanctioned by the Treasury, but it is said that the Government have taken an interest in the Company, and have entered into a contract for the purchase of the entire production of certain of the bye-products. The low-temperature process produces benzol, the spirit which is converted into motor spirit; while the residual toluol is one of the chief products used in the manufacture of high explosives. The first unit of the plant, to treat 50 tons of coal a day, is expected to commence working early in November; and eventually the plant is to be increased to a capacity of 200 tons of coal a day. The further progress of the enterprise will be watched with the deepest interest at the present juncture."

LEGAL INTELLIGENCE.

CHARGE AGAINST A GAS COLLECTOR.

At the Salisbury City Petty Sessions, William Lucas, formerly slot-meter collector in the employ of the Salisbury Gas Company, was charged with embezzling several sums of money. It was stated that until January last he was collecting practically by himself, with a little assistance now and then when he asked for it, from the whole of the slot-meters in the city, which numbered about 3000. After that time he had assistance given him; but the other collectors merely accounted to him for what they received, and not to the Company. The night before he made a collection he went to the Company's office and took certain sheets which referred to the particular meters he was going to collect from. On these sheets, after he made the collection himself, he would put the date of the collection, the index, then the amount shown on the meter, and also the actual consumption since the last collection. The sheets never went into the possession of any other sub-collectors; and the sub-collectors only received from the defendant slips of paper with the numbers of the houses to which they had to go. On the slips they filled in the amount they collected from the slot-meters in the houses, and the amount shown on the meter. The sub-collectors had no knowledge whatever as to whether what they collected was the proper amount according to consumption, because they did not know what the consumption was. The collectors never had, as far as they could remember, any complaint from the defendant—who checked their money when they brought it in—that he had not received enough. Recently officials of the Company came to the conclusion that the collections were not being carried out properly, and that there were arrears of work; and they announced to Lucas their intention of employing another collector in addition to himself, who would also take out sheets and be responsible to the Company for the amounts he collected. This new man was to be an assistant collector, and not a sub-collector. When the defendant heard of this, he went away; and since then several letters had been written by him. The first of the letters was received by Mr. Norton H. Humphrys (the Manager), and in it defendant said: "I have saved my wife and my child's life by doing wrong. I must have spent hundreds of pounds on their lives, and my little son who died, and six before him." It was found that collections had been made from certain houses, and the money paid to defendant, who had never handed it to the Company. Lucas had been in the employ of the Company for 25 years. At the time he went away he had in his possession 250 of the Company's sheets, which after he left were found in his bag, with certain money. The 250 sheets showed that a collection made with the various sub-collectors just before the defendant went away resulted in about £20; but the sheets actually showed that the consumption since the last taking was 729,200 cubic feet. This, at its cheapest rate of 3s. 9d. per 1000 cubic feet, came to about £136. One charge only was gone into before the Bench, and to this [which related to the embezzlement of 7s.] defendant pleaded guilty. He was sent to prison for two months, without the option of a fine.

Ilkeston Council Troubles.

At the Ilkeston Petty Sessions last Thursday, Mr. William Smith, a member of the local Town Council, summoned Mr. William C. Coxall, the Borough Accountant, for "obstructing him as a burgess and a person authorized to inspect the water services and charges book." For the prosecution, Mr. Ellison quoted the Municipal Corporations Act, which said that the treasurer's accounts shall be open to the inspection of the council; and if a person having the custody of any such document obstructs a person authorized to inspect them, he shall be liable to a fine not exceeding £5. The particular accounts related to water supplied by the Ilkeston Corporation. In consequence of complaints received by Mr. Smith, with reference to certain ratepayers having been overcharged for water, he went to the Borough Accountant's office to inspect the register of water charges, which was handed to him by the clerk in the water office. While he was inspecting the books, the Borough Accountant entered and snatched a book away from him. Mr. Smith then consulted the Town Clerk as to whether the Borough Accountant was within his right in refusing to allow him to see the books; and the Town Clerk replied he was not prepared to give an off-hand opinion. Shortly afterwards a ratepayer was found to have been overcharged to the amount of £1 5s. 3d.; and the latter received a letter from the Borough Accountant stating that, "on investigation," he found he had been overcharged, and in due course a cheque for £1 5s. 3d. would be forwarded. This showed the motive of Mr. Coxall in disputing the Statute. It also showed the necessity and duty of members of the Council to investigate these matters for themselves and not to take the word of an official, because all officials were liable to make mistakes. A long legal argument ensued. After the water charges register had been produced, Mr. Huntsman (for the defendant) argued that it was in no sense an account book. He also contended that the summons had been wrongly issued under the Municipal Corporations Act. The powers of any public authority in these matters were contained either in the Public Health Act or the Water-Works Clauses Act—not the Municipal Corporations Act. The Chairman declared the Bench were unanimously of opinion that under the Municipal Corporations Act, 1882, the case failed. They were, however, strongly of opinion that the ratebook ought to contain the particulars, so that every ratepayer could see how, and for what, he was charged. There should be some evidence that members of the Council and burgesses could go and receive strict courtesy, and have all the information they required. An application for costs was refused.

Provisional notice has been given by the Directors of the Kirkham (near Blackpool) Gas Company of their intention to raise the price of gas from 3s. 8d. to 4s. per 1000 cubic feet.

MISCELLANEOUS NEWS.

A JUBILEE AT PAISLEY.

Mr. G. R. Hislop's Fifty Years' Service.

Before proceeding to the ordinary business at their meeting last Tuesday, the members of the Paisley Town Council took part in a pleasing function—that of expressing to the Gas Engineer and Manager, Mr. G. R. Hislop, on the attainment of his jubilee, the Council's and the community's appreciation of his invaluable services, their congratulations that he has been spared to give fifty years of service, and their hope that he may yet be blessed with many happy days.

Provost ROBERTSON (who wore his chain of office, an indication, as he explained, that something unusual was to happen) said when it became known that Mr. Hislop was completing his 50th year in the service of the Corporation, the members of the Town Council felt that an occasion so unique should not be allowed to pass unnoticed; and it was unanimously agreed to present him with a token of appreciation of his services, and also of respect for him as a man. It fell to the lot of few men to spend fifty years in one service, and to few corporations to be served for fifty years as he had served them. Not only had Mr. Hislop served Paisley during all this time, but he had been rendering great service to his country as well. Being an enthusiast in the work, he was not content with gas making as he found it, but believed many improvements could be made in the manufacture. He applied his mind to the subject, and by research and study introduced many appliances and processes which had gone a very long way to cheapen production. At the present moment, he believed, Mr. Hislop was one of the highest—if not the highest—authority on gas production in the country. In the fifty years that had gone, Mr. Hislop had seen many Conveners, men of various types, temperament, and ability. These Conveners were supposed to assist him; but, as a past-Convener, he could state that no assistance was needed by Mr. Hislop. The easiest way for a Convener to run the department successfully was to leave the conduct of it entirely in Mr. Hislop's hands. [Laughter and applause.] Mr. Hislop invariably got his own way, and that way usually turned out right. On behalf of the Town Council of Paisley, on behalf also of the citizens whom they represented, he had to hand over to Mr. Hislop a silver tray, bearing the inscription:

> Presented by the Town Council of Paisley to George R. Hislop, Esq., C.E., F.C.S., on the attainment of his jubilee as Engineer and Manager of the Paisley Gas-Works, in token of high esteem and appreciation of long and faithful service.

Not only did it bear this, but it was inscribed with the signatures of the members of the Town Council and of the Town Clerk. It appeared to him a wonderful thing to see Mr. Hislop so active both in mind and body after fifty years of arduous work; and he wished to convey to him the assurance of the high regard in which he was held by the townspeople and the Town Council, and their high appreciation of the services he had rendered not only to them, but to the whole country. He hoped Mr. Hislop would be long spared to manage the gas-works. He believed the tray would find a prominent place in the recipient's house; and it would recall his long association with the Gas Department of the Corporation. These recollections, they hoped, would always be agreeable; for certainly Mr. Hislop's association with them had always been a happy relationship. [Applause.]

Mr. HISLOP (who was cordially received) acknowledged the handsome gift. He said his position was unusual in the experience of public servants; for he was the recipient of their kind sentiments and good wishes on the occasion of his jubilee. More than this, he had received a beautiful, tangible token of their esteem and appreciation; and he could hardly find language in which to express his thanks for all their kindness. He accepted the silver tray, bearing the signatures of all the members of the Council, with gratification. It would tell of the past long after he had ceased to look upon it. He had served under many worthy men, and it was interesting and impressive to recall them and their work. They had served their day in the municipal administration, and many had crossed the bourne, leaving him behind; and it had fallen to their successors in the Council now to act in the name of these old friends, as well as for themselves, in paying him such a splendid tribute. He had great pleasure in looking back upon the time when for five years he served the Gas Commissioners, as well as the forty-five years of his service with the Corporation. The only black spot in the latter period was the seven years, from the spring of 1900, when the gas tests reflected on his management. While the Corporation were paying for coal to produce 27-candle power gas, the tests returned the illumination as being 4 or 5 candles less. This represented a deficiency under his management of something like £6000 a year. It was a veritable brain-rack, until he succeeded in demonstrating the fallacy. It hurt him so much that he many times thought of giving up the management. There had been a few narrow escapes from bidding good-bye to Paisley. One was so far back as 1869, when the Glasgow Corporation took over the gas-works. He was specially requested to apply for the position, and got a good assurance of succeeding. The Paisley Board heard of it, and came to him very distressed, expressing the hope that he would not entertain the idea of leaving them. In view of this, and the fact that his elder brother expressed a desire to become a candidate for Glasgow, he withdrew in his favour. The final result rested between Mr. Foulis and his brother; and Mr. Foulis obtained the position. He had great pleasure in serving the Corporation, which was proved by the fact of his long years in Paisley. It had done very kindly by him; and the Conveners and Sub-Conveners who had been from time to time appointed had invariably proved very agreeable gentlemen, who offered him every encouragement in his work. The gentlemen occupying these offices now were typical of what he had said. In conclusion, he referred to a history of the gas undertaking which he had produced,* sending a copy to each councillor. He pointed out that he had taken the liberty to dedicate it to the Provost, Magistrates, and Town Council. It would serve to keep in memory the names of many councillors who were identified with the development of the gas-works. They had left their footprints on the sands of time; and happy they should be if they sought to emulate many of them in their self-sacrifice and devotion to the work that lay to their hand. He thanked all very sincerely for their tangible and verbal appreciation of his fifty years' services. [Applause.]

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* Reference is made to this history of the undertaking on another page.—ED. J.G.L.

Provost Robertson, in acknowledging the receipt of a copy of the history prepared by Mr. Hislop, said it was a beautiful book worthy of a place in anyone's library.

Another gift, from the staff of the Paisley Corporation Gas Department, comprised a handsome silver calyx-shaped cup. The presentation was made by Mr. A. S. Nisbet (the Assistant Gas Manager).

SOUTH SUBURBAN GAS COMPANY AND METER=RENTS.

The Proposal Abandoned.

Recognizing the dissatisfaction generally expressed throughout the district at the proposed increase of meter-rents, the South Norwood Ratepayers' Association held a special meeting last Friday evening to consider the matter. There was a thoroughly representative attendance. The President (Rev. John Warner, Vicar of South Norwood) occupied the chair. Mr. Wilfrid Wastell, the Secretary of the South Suburban Gas Company, was present by invitation.

The President, in opening the meeting, said they had met to consider a question which was causing all there, and very many people outside the meeting, a great amount of—he would not say heart-burning, it had not got to that—dissatisfaction. When the Company's circular reached them, many regarded it as a bomb, the contents of it somewhat asphyxiated them. He was not giving anyone away when he said that, in his opinion, they would leave the meeting a great deal more satisfied than when they came into it. He had seen criticisms of the Company's circular in the "Gas Journal." One argument used was that if the circular had been more definite, and not so very brief, there would have been less objection to it. He did want to say this, that if the circular had been more definite it would not have induced them to agree to the alteration of a charge for meters which hitherto had been considered fair. He quite agreed with the "Gas Journal" in the view that this attempt of the Company to remove inequalities would lead to fresh inequalities. He was not an expert in these things, and had only the very slightest technical knowledge of the whole matter; but when he considered that the original cost of meters, whether large or small, was entirely wiped-out over and over again where they were in use year after year, it was no satisfaction to be told that the consumers were to be charged more in order that £1000 deficit occasioned by the upkeep of gas-meters should be wiped out. Then they had to consider another question. When alterations of this kind were proposed, they were bound to consider the opportuneness or inopportuneness of the procedure at the moment. He thought the present was the most inopportune time to seek to raise the rental of meters just double. Gas had advanced in price. He knew there was the trouble about coal; but this was common to them all. If coal was costing gas companies more, they knew, also, that the income from residuals had increased tremendously. They had to take into consideration that the circular could not have been the end of all things. It was a question of Are you willing? He thought Mr. Wastell would hear from the meeting, and certainly from him, that they in South Norwood were not willing. He, for one, would not sign the circular; and he heard the same on all sides. They could assure the Gas Company of their reasonableness, and of their fairness; but at the same time they assured them of their feeling of injustice that at the present moment the Company should seek to raise the rent of gas-meters. They asked the Company, very conciliatorily, but very firmly, to reconsider their decision. He would like the meeting to hear Mr. Wastell.

The Gas Company Withdraw the Circular.

Mr. Wastell thanked the Association for giving him the opportunity of coming there and explaining the matter, which was one of grave concern to the Company, as it was to the residents. He felt as though he was a champion without a cause, because the Directors at an ordinary meeting that afternoon, when the matter came up for consideration after a fortnight's experience of the issue of the circular, had decided to let the matter drop. [Applause.] But he thought it was only fair to the Company that he should give the Directors' point of view, so that the members of the Association might go away with a clear idea of how the position stood. One thing which had troubled him in the correspondence and criticizing arising out of the circular was the one-sided view that many people had taken. There was an old saying that every question had two sides; he thought this question had 200. The one side which appealed to the Directors first was that in these times they, as a public company charged with a public service, must see that they performed this service, not only in the interests of the shareholders but also in the interests of the consumers. He would tell them one fact first of all. The charge of 3s. for meters was fixed a great many years ago. They had searched back to 1868, and it was made even in those days. Was it reasonable to expect a charge made nearly 50 years ago to go on in perpetuity regardless of all circumstances? The Company had to look at the matter from their own side first, and from the consumers' side next, or should he say, both these sides together. The Company found that, owing to the changes arising, the charge of 3s. was not sufficient to meet the charges on meters. The capital debit on meters was to-day not very far short of £100,000. This money had had to be borrowed, was spent, and the Company had to pay 5 per cent. upon it. The cost of repairs to meters and maintaining them was last year between £7000 and £8000. Taking the interest on capital, apart from the sinking fund and the cost of maintaining the meters, the Company had to meet an outlay of between £12,000 and £13,000. The universal principle in this district was to charge for meters. The meter charge then should be sufficient to recoup the outlay on meters. But it did not at present do so; and this was the difficulty they were faced with. There were two ways of dealing with it—one to continue the practice of a rent regardless of the size of meter, or else to adopt the general practice in these parts of a differentiating rate according to size. Looking at the matter from all possible points of view, the Directors decided that to introduce the differentiating system would have been to impose greater hardships on a greater number of consumers than would be the case by increasing the flat-rate. The "Gas Journal," which the President had quoted as the official organ of the gas industry, had fallen into error in saying the Company were trying to introduce a flat-rate when they had hitherto had a differentiating rate. Other criticism of newspapers he would not deal with, as it was based on a misapprehension of facts. He did say this, taking the total figures, their income from meter-rents was not sufficient to meet the outgoings on meters. Meters were mechanisms which, like clocks, were prone to go wrong. There was not a meter fixed twenty years which had not had money spent on it. It was a mistake to suppose that a gas-meter once fixed was fixed for all time. The proof of this was in the annual cost of repairs. The Directors had had to meet another objection—namely, that the time for this increase was inopportune. To this he was inclined to agree. If they had raised the rent when gas was falling in price, or had left the matter for happier times, there might have been less criticism. But he thought he might safely say that at whatever time they proposed to the consumer to give his consent to a voluntary increased charge it was morally certain there would be some amount of criticism. No man in his senses would willingly agree to pay more than he had been paying, whether now in war time or in the piping times of peace. There was one thing all the newspapers had omitted to state, either wilfully or from a lack of knowledge. The remedy was in the hands of the consumer. If a consumer thought he could maintain a meter for less than the Company did, he could do so. The Company operated under an Act of Parliament which, while it imposed obligations on gas companies, also imposed obligations on consumers. Under the Gas Acts, while a company could refuse to supply gas unless it passed through a proper meter, the Acts could not compel the use of a company's meter. He should like to bring this fact home, that if any consumer thought he could do better by his own private meter he had the right. [A Member: And the meter would be considered always wrong.] The accuracy of the meter was outside the jurisdiction of the Company—they had no right to challenge its accuracy. If the Company had an idea a meter was not right, then they asked that the County Council—the final court of appeal—should test it, and if it was found correct the Company paid the cost of testing; if incorrect, the consumer paid the cost. But none of the newspapers had pointed out the fact that a consumer could provide his own meter, and indeed had a statutory right to supply it, as the Company had the statutory right to decline to supply gas without a meter. He wanted them to feel that his Directors valued more than anything the friendly relations existing between the Company and the consumers right up to the present time. He believed that if only six consumers out of the thousands affected by this matter had firmly declined to agree to the new terms, the Directors would, rather than offend the six, have waited for a more opportune time, or have met the loss on the meters from some other direction.

Replies to Questions.

In reply to questions, Mr. Wastell said about 16,000 consumers were affected by the proposals. Of these, 5-light meters numbered between 5000 and 6000. The other consumers used meters of 10, 20, 30, 40, and 50 lights, and in any other district in London would have to pay much more than 6s. for such meters. If any one had any ground of complaint, it was the consumer with a 5-light meter. A 50-light meter cost £8. If they took the cost of providing the larger meters—fixing, maintaining, and testing periodically, added to the interest on capital—they would find was a rent of 6s. far behindhand. There were two propositions—to continue the flat-rate and increase the price, or to charge a differential rate according to the size of the meter. If they had done the latter, they would have adversely affected 10,000 consumers. It was this fact that induced the Directors to retain the old practice of charging a uniform rate rather than introduce a new principle of the differential rent. The value of the extra income to the Company would have been under ¼d. per 1000 cubic feet of gas. In order to make up the deficiency on the meters, the Directors did not think it would be fair to increase the cost of gas 1d., as this would have given them ¾d. per 1000 cubic feet, which the Directors did not want.

The President asked how much would the loss of the £1000 on meters decrease the dividends.

Mr. Wastell replied it would not affect them. A newspaper article had stated that the 9d. increase on meter-rents represented 1¾d. per 1000 cubic feet to consumers of 5000 feet. This was right so far as it went; but he doubted whether they had any, or many, consumers, of so small a quantity. The Company did not want to put 1d. per 1000 cubic feet on gas to make up a deficiency on meters—they wanted meter-rents to meet meter expenses.

A hearty vote of thanks was passed to Mr. Wastell for his presence, and everyone left the meeting well satisfied.

Restricted Lighting at Camberley.—Subject to the question of responsibility in case of accidents to persons and vehicles, as well as of damage to the lamps, the Blackwater Gas Company have advised the Camberley Urban District Council that they would be prepared to make a reduction of 2s. 10d. for each street-lamp the Council might request them to keep unlighted during the months of June to September. Reporting on the matter at the meeting of the Council last week, the Highways Committee stated that they had instructed the Clerk to write to the Company pointing out the great discrepancy between the amount charged to the Council and the sum of 2s. 10d. per lamp offered. The Clerk reported that the Company had replied stating they were unable to increase the amount offered. General Dalrymple expressed regret that the Company were unable to take a more liberal view of the situation. The Council accepted the concession.

THE DEPARTMENTAL COAL COMMITTEE.

Concluding Notes from the Evidence.

Some reference was made on p. 86 of last week's issue of the "JOURNAL" to the evidence given by witnesses before the Committee appointed by the Board of Trade to "inquire into the causes of the present rise in the retail price of coal for domestic use." The remaining witnesses who appeared before the Committee at their various sittings [which were held in February and March last] are now similarly dealt with. The members of the Committee were: Mr. Vaughan Nash, C.V.O., C.B. (Chairman); Professor W. J. Ashley, Birmingham University; Mr. J. Boyton, M.P.; Mr. W. Crooks, Labour Member for Woolwich; Mr. J. J. Dent; Mr. A. W. Flux (Director of the Census of Production, Board of Trade); Mr. Stanley Machin; and Mr. James Rowlands, M.P.

Mr. *Arnold Tebbutt* explained what had been done in Winchester with regard to the supply of house coal. They had been told that the only way in which sufficient supplies could be got in would be on the understanding that every truck would be cleared within four or five hours of arrival; and the only means by which this could be done was by the merchants pooling their coal in one common heap, from which each subsequently drew his share. Of course, in this way the different qualities became mixed. One retail price had been fixed for the whole of this coal.

Mr. *E. W. Winch*, the Secretary of the Guinness Trust, gave evidence as to the special arrangements made for supplying coal to the tenants of the Trust's workmen's dwellings in London.

Mr. *Hamilton Greig*, the Managing-Director of Messrs. Cory and Sons, was the next witness, and he described first how retail prices are determined on the London Coal Exchange. Speaking as a wholesale merchant, he did not like the sliding-scale arrangement; but the collieries had taken to it, and some absolutely insisted upon it. At the moment London was excessively short of coal; and this was the cause of the whole trouble. The collieries were nearly all claiming 20 per cent. reduction on deliveries under contracts. As a rule, a colliery owner sold largely under contract, to make sure of his pits being worked regularly, and played with the balance to make his profit. With regard to the apportionment of the 9s. per ton increase in the price of coal, he would put 4s. 6d. to the coalowner, 1s. to truck hire, 2s. for the increased cost of distribution, and wages were about 4d. a ton extra.

The CHAIRMAN: That leaves a gap of about 1s. 2d. It looks as if it leaves a little bit in favour of the coal merchants. I thought your suggestion was that the coal merchant, on current prices, was not making anything?

Witness: On what he has to pay to the colliery for current supplies. I could do with 40,000 tons a week more coal in London alone, if I could only get steamers.

Mr. *Errington Brewis*, representing two amalgamated firms connected with the London coal trade, as well as the largest colliery in Leicestershire, gave information as to the trolley trade, which he said is declining. An advance in prices, he thought, on the whole, was purely a spontaneous action on the part of the coal merchants. The advance in prices in London worked out roughly at 10s. per ton. If there had been no sliding-scale at all in operation, it would have amounted to as much. The sliding-scale was a compromise, and a protection to both the vendor and the purchaser. Undoubtedly the profit, in the case of a great increase in price, went to the colliery. There was really no such thing as a "ring" or "combine." It was not possible to place a maximum selling price on the London coal merchant unless a maximum price could be placed on the producer—the colliery owner. If the conditions that existed now continued they were at the mercy of the colliery owners, and the country was at the mercy of the colliery owners. There was a strong combination of colliery owners who regulated selling prices, and who regulated matters relevant to the trade wages, and that sort of thing. He thought a maximum price could be fixed that would make every colliery owner eager to work his pits and make a handsome profit, and yet be 6s. per ton below present prices. The maximum need not be fixed for the duration of the war. It might be subject to revision, if evidence could be produced that it was necessary to revise it up or down. At 2s. 6d. or 3s. a ton over the ordinary current prices of the last three years, the coalowner would be left with an increased profit. If there was to be regulation of price, he would say the sooner the better. As a colliery owner, he was not in a position to execute all his contracts. He had taken off 20 per cent. of the contract quantity under the terms of the contract.

Dr. *John Cadman*, Professor in the Mining Department of the University of Birmingham, said he was Consulting Engineer to two collieries in the Midlands, with regard to which he quoted a number of statistics bearing on the price of coal. He stated that he had had to buy coal recently from a small dealer at a price which came out at almost 2s. per hundredweight. Trying to arrive at a reason for such a price, it seemed to him the man who was selling in a small way like this was buying through about four or five stages from the colliery—there were so many middlemen.

Mr. *Thomas Hutton* gave further evidence of the trolley trade in Poplar. He said that at the depôt from which he drew his coal there were three or four merchants; and he had to buy through them. It was a tied depôt to the merchants there. If he did not buy through these merchants, he could not get to the depôt, as the railway company would not accept him. Afterwards he had a better price offered to him outside by a colliery agent or factor; but he could not accept it. He was not able to go on the Coal Exchange and buy.

Mr. *A. M. Wright*, representing a colliery company having pits in Derbyshire and Nottinghamshire, remarked that so many of the men had gone that he had to reduce deliveries on contract by 10 per cent. The want of coal by water was affecting London enormously. He thought about 55 per cent. of the coal which came to London was water-borne; and a good deal of this was household coal. He had not been in the position of feeling himself unable to supply the whole of the quantity contracted for, and then selling the same merchant from the free coal certain amounts at current prices.

Professor ASHLEY: But however it is brought to you, it is the case that at the very time you are informing the merchants that unfortunately you will not be able to give them the whole of their contract quantity, you are still selling coal at current prices?

Witness: No; I do not think so. Not the same coal.

Mr. MACHIN: I take it you would not feel at liberty to sell your surplus coal (say, 15 per cent.), until your contracts had been completed?

Witness: Certainly not. Contracts must come first, and always have done.

Mr. CROOKS: Did the notice that you could not supply up to the contract quantity to the extent of 10 per cent. represent the falling off of the output? It did not leave you a greater free margin for sale?

Witness: No.

Now, 9s. per ton is an abnormal rise in two months?—It is only the public clamouring for the coal, and not being able to get it.

Sir *Richard Redmayne*, K.C.B., Chief Inspector of Mines, asked to give a rough idea of the number of miners who had enlisted, replied between 130,000 and 140,000. Over the whole of England, the figure would be from 10 to 12 per cent. Speaking generally, he did not think the working cost of coal due to the war had gone up to anything like the figure that people imagined. Unless there were some extraordinarily peculiar conditions, he would regard 1s. per ton for the increased cost of working the coal as a preposterously high figure.

The CHAIRMAN: I suppose things are in such a condition that it would be rather dangerous to propose that any inroad should be made on coal ordinarily used for industrial purposes to enlarge the domestic supply. The industrial coal and domestic coal both appear to be short. Is that borne out by your experience?

Witness: Yes; I think they have great difficulty in some parts of the country in fulfilling their contracts for both classes.

Replying to further questions, witness said he thought one must differentiate between the rise in the price of coal in London and that occurring elsewhere. The rise in London was a very fictitious one. To some extent it was warranted, and to some extent it was not. The fixing of a maximum price for coal at the pit-head would be possible, but it would be difficult. He did not think the miner was slacking when he was at work; but he was taking holiday very often. Something over 500,000 tons—after allowing for falling off in export and bunker coal trade—was the actual month's shortage of supplies compared with normal times on the basis of January.

Mr. *George Rose* explained that he was connected with a firm of coal factors, who supplied coal merchants, large consumers, electric light works, railway companies, and municipal bodies, on a wholesale basis. He was also a director of a retail firm, and in this capacity could say that there was no real controlling body which regulated the price of coal on the London Coal Exchange. It was generally a matter of discussion between the leading merchants. Probably there was no business in London where the competition was so keen as in the coal trade. In a general way, he could not consider present prices in London were in any way extravagant, having regard to the circumstances. Collieries were asking him to accept diminished amounts on contracts, and at the same time were supplying free coal. The matter would probably come before the Courts. The item of waggon hire came largely into the increased price. At the moment the question of transport was far and away the most important point of the whole situation.

Mr. *S. Allen* and Mr. *J. Burgess*, managers respectively of the coal departments of the Co-operative Wholesale Societies in Manchester and London, then gave evidence as to the methods of working adopted, and prices. A case was cited of a particular colliery that had knocked 20 per cent. off contract deliveries. They actually, however, supplied 140 per cent., and charged an excess price on 60 per cent. In another case, 75 per cent. of the coal under contract was supplied. But instead of 416 tons a month, 716 tons were supplied; and extra was charged on 400 tons.

Lieut.-Colonel *A. Leslie*, the Organizing Secretary of the Admiralty Coasting Trade Office, told the Committee that this organization was designed to bring into use certain interned enemy vessels primarily for the relief of the coal trade of London. There were 25 of these steamers which had been running for a fortnight, and had carried something like 130,000 tons. The coal carried was for public utility companies and institutions as far as possible. The freights were governed by the market rates. The highest they had done was 13s. per ton. Two managers had been appointed at Newcastle; and they acted in exactly the same way as agents for ship-owning companies. The ships were a mixed lot; and the managers made as good a business bargain as possible with them. They were, however, instructed not to force up rates. They had always been, day for day, a little below the market rates. The consumer had got relief from these interned ships to the extent of the coal which had come in. He did not agree that, as far as cheapening the coal was concerned, the dealing with interned ships was an absolute failure. The idea was to send tonnage where it was most needed.

The CHAIRMAN: The domestic supply of coal really comes in through the gas-works—at least, that is our view—because the poor man, instead of using coal, now uses gas for cooking, heating, and everything else. So to all intents and purposes the domestic supply of London largely comes through the gas-works?

Witness: It is used in the form of gas very largely. But there is an enormous domestic consumption also; and you can only really deal with this, I take it, from the practical point of view on the railways, because the railway depôts of London are the distributing centres for domestic coal.

Proceeding, witness explained that the Over-Seas Prize Committee dealt with the interned steamers, and also the prize steamers; and the Admiralty Coasting Trade Office was an offshoot to deal with the former. The London Coal Advisory Committee was brought about with a view to try to find out the position of the various public utility companies as regarded their sources of supply, stocks, and consumption, and also to endeavour to work in such a manner that any one of the companies finding themselves getting very much into a hole for supplies of coal would be able to get, through the Committee, a recommendation for priority of service.

Mr. *J. M. Eddy*, Mineral Traffic Manager of the London and North-Western Railway, was examined at considerable length as to transit and waggon arrangements. He claimed that coal had been brought to London as rapidly as the people who were to deliver it could do so, or even more rapidly. Generally, his conclusion was that the cause of the great increase in retail prices was that there was less output at the collieries. There had been some difficulty at collieries from want of railway waggons.

Mr. *H. L. Symonds*, Chairman of the Manufacturers' Section of the London Chamber of Commerce, said he had circularized 128 firms who were believed to be users of coal for manufacturing purposes. To the question, "Have you experienced difficulties in getting the usual supply of coal?" there were 54 answers in the affirmative, and seven in the negative. The second question was, "Have you been seriously prejudiced in your trade by the difficulty of obtaining coal supplies, owing, firstly, to increased prices, and, secondly, to delays in delivery?" To the first part of the question there were 43 answers in the affirmative, and to the second part 42; the answers in the negative being 13 and 14 respectively. Broadly speaking, those who said they were not seriously prejudiced appeared to be the smaller firms. Another question was, "Have you had any difficulty in obtaining coke or other fuel for the purposes of your business?" The answers were 31 in the affirmative, and 17 in the negative. The next question was, "Have you found it possible to extend the use of alternative sources of power—for example, gas and electricity?" Eight firms had been able to do so, and 35 had not.

Mr. *W. H. Hewlett*, Director and General Manager of the Wigan Coal and Iron Company, and Chairman of the Lancashire and Cheshire Coal Sales Association, said the latter body was an organization of coalowners. Lately the functions, as regarded the regulating of prices, had been rather of a restraining character. The Association did not regulate the pit-head price, but the price absolutely to the consumer. Lancashire supplied a good deal more coal direct to the consumer than did the ordinary type of collieries. If it had not been for the deliberations of the Association, he was certain prices would have gone much higher. He would say that 1s. per ton as the increased cost of working the pits was nearer the mark than 2d. or 3d. He thought the railways had done what they could. The retail price in Lancashire had only been advanced 10d. per ton.

Mr. *Roslyn Holiday* next gave evidence as to the West Yorkshire district. The principal cause of the reduced output, he said, was absenteeism—for what reason, he could not say. The Company of which he was Manager had adhered absolutely to their contracts. They, with a good number of other collieries, had abandoned the sliding-scale. The cost of getting coal had increased very much. He would put the figure for the colliery with which he was connected at from 1s. 3d. to 1s. 6d. per ton. It was not the fact that the market price rose or fell largely from day to day because of pit-head prices. It was the pit-head prices that rose and fell with the market price.

Mr. *William Johnson*, M.P., the Miners' Agent for Warwickshire, said the men were working practically full time when they could get the waggons. The collieries had done their best; but they found they could not keep the men going. The recruiting figure in Warwickshire was something like 20 per cent. He did not think it was the smaller number of men in Warwickshire that had caused the falling off in output, but the shortage of waggons. They could, he believed, have produced 10 to 15 per cent. more coal, if they had had the waggons.

Mr. *W. G. Phillips*, representing a Warwickshire colliery, stated that the output of coal in the county had been very seriously affected by the war—principally owing to the shortage of men, due to enlistment, and to an appreciable extent to the congestion of railway traffic, causing a shortage of trucks. The best quality coal had gone up from something like 16s. a ton to about 20s. a ton at the pit. They did not sell under sliding-scale contracts in Warwickshire. It might be taken generally that in this county they had given notice to take 20 per cent. off the contracts. With this 20 per cent. reduction, there would not be more than 40 per cent. of free coal. There was no Association in Warwickshire to deal with prices. The owners acted individually. That London was rather useful as a dumping-ground, was an excellent description of the market.

Professor ASHLEY: You would say that in this national emergency, the coalowners claim to retain the usual quantity of free coal?

Witness: Practically that.

Mr. CROOKS: Do you think the war shortage of trucks and men would justify an increase of from 10s. to 12s. per ton to the consumer?

Witness: I would rather not answer that question.

Mr. *Arthur Westlake*, representing the Staveley Coal and Iron Company, gave evidence as to the position of affairs in Derbyshire. His Company, he said, did about 90 per cent. of their trade under contract; and they were approximately delivering their contracts in full. Personally, his inclination was to sell always at fixed prices; but there was competition to meet, and they gave their customers the option of buying in which way they chose. The increased cost of getting coal since the war began, he would put at about 1s. per ton. There were various bodies which would probably be called selling associations. They were all local organizations, and met to confer about prices; but he would not like it to be supposed that these associations were in any way "rings." They were not strong enough. There was nothing unusual about the procedure, and no mystery. The loss of output had been the most important cause leading to high prices; and he attributed a good deal to panic buying, first on the part of the general public, and then on the part of the merchants. He would not on any account sell on the sliding-scale next year.

Mr. *C. Hipwood* and Mr. *H. P. Everett*, of the Marine Department of the Board of Trade, gave evidence as to the use of the interned vessels for coal carrying. The policy, it was stated, had been to keep somewhere near the existing market rate of freights, but to keep below it. The object of this policy was no doubt to lead the market in a downward direction. The interned ships seemed to have had a considerable effect in reducing the freights. Many of the interned ships were large boats, and could not be used in the London trade. It would be extremely difficult, with other ports and services clamouring for freights, to put preferential terms at the disposal of the London utility companies. The first difficulty would be that of discriminating between the very numerous and pressing applications there would be for tonnage at specially low rates; and the second, that of securing that the benefit should go to the consumer, and not be intercepted on its way. In the case of the gas companies, with their sliding-scale arrangement, if they took full cargoes and they were the only people concerned, there would be no difficulty at all. One could give them boats at simply the cost of running them, because practically the whole of the benefits would go straight to the gas consumer. If the gas companies had been the only people who had to be considered, it would have been a much easier problem to deal with. If a practical solution of the difficulty could be found, no doubt it would be considered. Looking at the gas companies' case as it had been put by Mr. Milne Watson, it appeared absolutely unanswerable, taken by itself. Vessels belonging to the companies had been commandeered. They were badly hit; but the ordinary shipowner was hit in exactly the same way. A shipowner might not have direct customers in the same way as a gas company had; but he had indirect customers, who had to suffer. Freights had dropped very rapidly during the last ten days, to 8s. per ton [March 23].

Mr. CROOKS: Would you be surprised to know that in no place in the country, so far as we can discover, has the price of coal gone up as it has done in London; and the fact of your keeping the freights where they are has rather accentuated the difficulty than otherwise? We actually howled from the house-tops that the moment we got these interned ships, down would come the price of coal; and we found that the first thing we did was that we charged 13s., because the market had charged this rate, and the very people who were fleecing the public were encouraged to do so by the Government.

Mr. *Hipwood:* That is one way of putting it.

Mr. CROOKS: It is the man-in-the-street's opinion; and it is certainly mine.

This concluded the evidence taken by the Committee.

CO-PARTNERSHIP IN CHEMICAL INDUSTRIES.

Sir William Lever's Address to the Society of Chemical Industry.

At the Annual General Meeting of the Society of Chemical Industry, held in the Manchester School of Technology last Wednesday, an address was delivered by Sir WILLIAM LEVER, Bart., M.P., of Port Sunlight, dealing with the subject of "Co-Partnership in Chemical Industries."

Professor HENDERSON presided, and expressed regret at Sir William Lever's inability to be present. He had, however, sent a very good substitute in his son, Mr. Hulme Lever, whom he would ask to read the paper.

The author prefaced his remarks by stating they had become accustomed to hear it stated on public platforms and in the public Press that the British had allowed the Germans to acquire the lead in the fields of chemical industry. When they examined these claims they found that it was not because the Germans had originated more inventions, or made more important discoveries than either the British or the French. On the contrary, they found that the initial genius of inspiration had not been of German origin, and that whatever advantages the Germans might have acquired had been accomplished by their better industrial organization, and the better financial support given by their banking institutions and by the Government. The war had given us our awakening. Our industries would be stimulated to organize efficiently as a direct result of the war; but they should not fall into the common error, prevalent to-day all over the world, that the only thought they need give was to the attainment of efficiency in mechanical appliances, in chemical knowledge, and in banking arrangements. These must all receive the fullest consideration; and there would only be one disaster worse than neglect of these essentials, and that would be the neglect of the human element, without proper consideration of which our industries could not be efficiently carried on.

THE HUMAN ELEMENT.

After a reference to the problem of the human machine, and the variable nature of it, Sir William said that when they were dealing with chemicals they knew exactly how they would act and re-act under given conditions. If they could be equally certain of the effects of various methods of dealing with the human machine, the problem would not be a difficult one. There was no combination of forces or chemicals so delicate and intricate as the mind and body of the human machine, and for this reason—that no two human minds and bodies were alike.

APPLICABILITY TO THE CHEMICAL INDUSTRY.

Sir William Lever said his contention was that the larger the industry, and the more complex its organization, the less it was possible for the Board of Directors or the supreme management to know personally of the individual characteristics of the employees engaged under their direction. Therefore it had become essential that there should be some co-partnership system introduced into our industries. He knew of no industry to which this applied with greater force than to the chemical industry. A British chemical industry, founded upon the principles of co-partnership, with employees trained and instructed as to what these co-partnership principles meant, and realizing the opportunities co-partnership offered them, would surely possess employees superior to those of competitors in Germany, or elsewhere, under mere wage and salary conditions.

It was more difficult in the chemical industry than in any other industry to assess the services of each member of the staff, whether as inventor, developer of the inventions of others, or organizer, or rank and file employee carrying on the routine process of production. They all of them found an increasing difficulty in gauging the results financially of new developments in chemical industries. Some of the greatest disappointments they had had in their businesses had followed upon the greatest prospects of success. It only wanted a chemical process to be delayed in the realization of full success for losses instead of profits to result. Sometimes the smallest and the most insignificant means of development had produced the most profitable results; and often the most costly experiments had produced nothing but losses. It must, and could only, be viewed as a whole; and the success of the industry could only be gauged by the success of all its parts. It was an absolute essential to success in the chemical industry that new and costly experiments should be made, and for expensive plant to be installed which might afterwards have to be scrapped. It would not produce that spirit of comradeship and feeling of fairness to discriminate in giving a fixed share of the profits between the various members of the staff engaged in the several departments of these new experimental developments. It was always possible, by means of salary, to make special recognition to the possessor of special abilities for the solution of difficult problems. Yet the possessor of these superior abilities might fail in the solution of some difficult problem; while another, possessing inferior knowledge and inferior ability, might succeed with an entirely different, and what might prove an easier, problem to bring to a profit-earning successful conclusion. These adjustments of abilities could best be made in salaries; but the broad success of the undertaking to which the unsuccessful experiment might have equally contributed with the successful experiment, because that ground had to be covered, as men had to cover mountains in search for gold, and could not discover gold without many borings without results—the broad success of the business could only be recognized, so far as the employees were concerned, on a system of co-partnership. He could not help but think that, working on these lines, the whole staff in the chemical industry, as in all other industries, would respond. He had the utmost faith in human nature, and believed that it could be trusted and depended upon nine hundred and ninety-nine times out of a thousand to respond to fair, just, and proper treatment. Often when they were disappointed with effects produced by co-partnership on employees, if they searched a little deeper they found that they had overlooked some point or other in their arrangements which had prevented the best results being obtained. In other words, to use a chemical parallel, their temperatures might have been wrong, or the catalyst might have been poisoned; and not until they discovered the right temperature and prevented the poisoning of their catalyst would the system succeed as it should do. Equally so, as they were in the very infancy of the study of co-partnership and profit sharing with employees, it might be that they had not yet got all the details correct, without which the transmutation from a lower value to a higher value could not be achieved.

Rules for Present-Day Co-Partnership Schemes.

1.—Profit sharing or co-partnership must not degenerate into charity or philanthropy.
2.—Its objects must be the increased success of the undertaking, with increased prosperity for all connected with it.
3.—It must not place management in the position of servant to labour through liability to criticism and censure.
4.—It must ensure to labour freedom from interference of management in the enjoyment of the benefits derived from profit sharing.
5.—It must possess greater stability than a mere system of bonus cash payment.
6.—Its benefits must be felt by the wives.
7.—It must have a distinctly elevating tendency on management and labour, raising them in the social and intellectual scale, and increasing their power for enjoyment and happiness as well as their power of usefulness.
8.—Control must remain with those who find the cash capital.

Gains of Co-Partnership.

Only by a system of co partnership, or profit sharing, could payment in addition to salary or wages be given. For not only was it true that wages were paid out of the product of labour, but profits must also come out of the product of labour, whether that labour was the brain and managing power of the directors and managers or the skill and labour of the workmen. The gain to the industries of the country by the adoption of co-partnership or profit sharing would not be confined solely to the stimulating of the direct personal interest of the employees. There would be another gain, which would be the release of the directors and managers to devote more of their time, freed from minor details, to the consideration of larger problems requiring attention and solution. The present salary and wage system might bind in fetters the employee; but it was only another illustration of the truth of the old Egyptian saying: "The chain that binds the captive holds the captor." By giving a direct personal interest to the employee, less personal supervision would be required from the employer, and the employer would be freed from the fetters that tied him down to close supervision of the employee. Partners were worth more than wage drawers; and when each employee, in proportion to his ability to affect the result, had become interested in the joint product of brain and muscle, they would then have reached a solid basis for the chemical industry, as for all other industries. By freeing labour to participate in the products of its own industry, they would liberate capital and management simultaneously for the enjoyment of a broader, a higher, and a more useful life.

DISCUSSION.

Sir William Ramsay, K.C.B., F.R.S., who opened the discussion, observed that he had had experience of three systems of employment under different authorities. Shortly put, however, the best system of all was the "double system" advocated by Sir William Lever, whereby the man received a fixed salary *plus* a share in the profits. It was very difficult to analyze motives; but as one who had spent a considerable time under three methods of payment, he had no hesitation in deciding in favour of the one mentioned by the author.

Mr. Walter F. Reid (Addlestone) expressed agreement with the principles enunciated in the paper. Under the present industrial conditions it was not, however, possible for everyone to introduce such a scheme. He was bound to say that many employees looked upon a master's motives with suspicion. He had tried to introduce the payment-by-results system, in addition to the ordinary wages which the local Trade Unions insisted upon. This method gave a man a better chance of improving his position in a modern factory. He had met with workmen who did not thoroughly appreciate the advantages which they were deriving from such systems. On the other hand, he had found it an advantage to give a workman who did something out of the ordinary groove a bonus for himself. By this method the employee was encouraged, and gave the best he could. Some employers, he was sorry to say, did not thoroughly appreciate a workman's suggestions nor adequately reward him if he suggested certain improvements. He thought they should establish it as a regular principle that if a workman suggested a workable and profitable idea he should be rewarded for it. It was not given to every commercial man to be able to introduce the methods prevailing at Sir William Lever's factories. The conditions of modern industry did not make it possible for general procedure on the lines laid down by the author; but whether or not it was possible to do so, he heartily agreed that it ought to be done, because it benefited both the employer and the workman.

Professor Henry Louis (Newcastle-on-Tyne) said he was in favour of the scheme advocated by Sir William Lever. One could quite see that the future of British industry lay in the hands of the workmen. It was all very well to talk of improved machinery and of kindred subjects; but unless the workmen co-operated thoroughly the future outlook for our industries appeared very gloomy indeed. He was convinced that until they got a more enlightened attitude on the part of workmen they were going to have difficulties of the gravest kind to contend with. The speaker went on to allude to the attitude of the South Wales miners, and emphasized the necessity of educating not only the workmen themselves, but the men's responsible leaders. Probably the only way to do this was by interesting the workman in the result of his labour. This arrangement was the most equitable one, because it probably gave the best results in the long run. No doubt a good deal could be done by instilling into the workman and his leaders the principles of economics; but so long as the working man stuck to the heresy that the less work done the better for the working man, they could not hope to advance much. He was convinced that the best weapon they possessed for advancing the national industries as a whole was by giving the man an interest in the work he did. He endorsed Mr. Reid's view as to the working man's suspicion of motives, and agreed with that speaker when he declared that it was not every workman who cared to work now for the remote and contingent profits of three, six, or twelve months hence. Some few years ago a North of England colliery proprietor of his acquaintance was approached by a deputation of workmen who sought his advice as to what they should do with their surplus money—they had been earning very good remuneration for some time past. The advice of his friend to the men was to put their money into the 6 per cent. debentures of the company, adding that it would be perfectly safe. The answer of the men, however, was that this would not do—they were "ower young to save." What would profit-sharing have done for this class of man? A great number of working men had no necessity or wish to increase their incomes. What they wanted more particularly was to have less time for work and more time for play. He was speaking from his own experience of Tyneside workers, where one saw the condition of things most markedly in the shipyards. Before they could venture on a method such as that advocated by Sir William Lever, they must go through a slow and progressive stage of educating the workers. He desired to make it clear that he was not speaking in any sense with the idea of objecting to co-partnership or profit sharing. Something on these lines was badly needed; but he had his doubts whether a method such as had been advocated was the proper remedy.

Mr. Charles Carpenter, D.Sc. (President-Elect of the Society), said the average workman to-day was not a contented workman, and the general impression in his mind was that he was not receiving a fair share of the profits to which he was justly entitled, and to which he had every reason to expect that he should share in. He had been working under co-partnership principles for twenty-seven years, and was very pleased to be able to welcome Sir William Lever and his large undertaking as one of the recruits of the principle, more especially as in the early days when co-partnership was first taught Sir William was not in favour of it. He had, however, grown to be in favour of it, and was to-day one of its staunchest supporters. Personally, he did not think the bonus system was the solution of the difficulty at all. By inducing the working classes to take the same intelligent interest in the welfare of the industry as did the middle classes, they would go a long way to get over their difficulties. The principles of co-partnership were as applicable to the establishment employing 10,000 men as to the undertaking with 40,000 or 50,000 men.

Dr. Gilbert J. Fowler (Manchester) said the whole trend of the discussion showed that not only was it desirable, but it was apparently necessary, to increase the interests of our workmen in the work they had to do. The only point of difference seemed to be what was the best means of achieving it. A friend of his was about to undertake new employment, and it was his intention to acquire a thorough knowledge of his duties by going through the workshops from the lowest rank and working himself up. It was in this kind of direction that they would have to look forward for improvements in the relationship between capital and labour. Many of the great industries to-day were built up by men who had gained practical experience in the workshops, and knew all there was to know about the products they were handling. If they were to advance in their chemical industries, it was very necessary that those who were going to control them should first acquire the practical experience gained by going through the mill. Just as officers and men were fighting side by side in the trenches to-day, so, too, in the new era would they find that all classes would have to work together. The apparent conflict of interests and the occasional mistrust of one another would have to be eliminated.

Professor William A. Bone said he had listened to Mr. Carpenter's remarks with pleasure and interest. It was, of course, more difficult to apply co-partnership principles in an industry like iron and steel than in a gas company, where prices did not fluctuate greatly or the profits differ appreciably from year to year. A good deal of discrimination was needed in order to apply the principles satisfactorily between the different branches of industry.

Mr. Hulme Lever briefly replied on the discussion, and remarked that the greatest compliment that could be paid to the author of any paper was to have his remarks followed by interesting discussion.

WELSBACH LIGHT COMPANY, LIMITED,

Business under War Conditions.

The Ordinary General Meeting of the Company was held on Wednesday last, at Winchester House, Old Broad Street, E.C.—Mr. J. R. Yates, the Chairman, presiding.

The Secretary (Mr. E. J. Butcher) read the notice convening the meeting, and the Auditors' certificate; and the report and accounts were taken as read.

The Chairman, in moving the adoption of the report and accounts, said that for the second time they met while under the shadow of the great war. When he last addressed them, a few weeks after hostilities began, he indicated that the war must affect the Company, not merely to the extent common to most commercial businesses, but more so because the incandescent lighting trade had in the past been largely dependent for supplies of raw materials upon foreign countries. He then stated that steps were being taken to minimize so far as possible any detriment which might consequently occur to the interests of the Company. In this connection, the general policy of the Board, and particularly that of endeavouring to secure and maintain the control of ample cash resources, had, he thought it might be fairly said, stood the Company in good stead—at any rate, up to the present stage of this unexampled upheaval. It was not merely that the cost of raw material of various kinds had so much increased, but that there had been occasions when it had not been merely a question of price, but of obtaining the material at all, within the necessary limit of time. He was glad to be able to say these problems had been successfully grasped and dealt with up to the present. He had thus briefly referred to the effect of the war on the Company's position as buyers. As sellers, also, they, in common with other British manufacturers of gas-mantles, had had to meet competition which it would be flattery to call legitimate. While British manufacturers had, perforce, to raise their prices, consequent on the increased cost of raw material, of labour, and of all incidents of production, attempts had been made, and with too great success, to flood the country with cheap Continental goods of dubious origin, but through neutral channels. To try to meet and defeat this campaign had involved much care and vigilance. As one illustration of this—and it might be multiplied—he would refer to the fact that within the last week or two they had discovered that a trading concern in the North of England was importing cheap mantles in plain boxes bearing no marks, and that on arrival in this country they promptly stuck on the boxes containing these inferior importations one of the Welsbach Company's trade marks the word "Palm," and sold them as "Palm" mantles. As the result of their activity, they had obtained an apology, which they were authorized to publish, and a delivery-up of the offending labels, together with an undertaking against further infringements. The only effective way in which purchasers could guard against these doubtful mantles, was to refuse to buy any that did not bear the name of a known and recognized English manufacturer. As the shareholders were aware, "Welsbach" mantles were made solely at the Company's Wandsworth works, by British labour. The Company had from time to time informed the Government Departments dealing with the matter of all seeming irregularities that had come under their observation. The authorities pointed out to them that, under a notice issued in April last, all such imported goods must have a British consular certificate to the effect that the consular officer was satisfied, from evidence which was produced to him, that the goods were not of enemy origin. Notwithstanding this fact, the Company discovered, some months ago, that goods so certified by consular authority were, in fact, of enemy origin, and exported since the commencement of the war; and it was through representations made by them to the Home Office, and with the Company's assistance, that the Government instituted a prosecution at Bow Street for an offence of this character against the Dutch agent who negotiated the transaction. Ultimately the prosecution was, after a statement by Counsel for the Crown, withdrawn, as it was felt the Dutch agent concerned had possibly, if not probably, acted innocently. There had naturally been a tendency for expenses to increase all round. This could not always be met by increasing prices to their buyers; and, regard being had to these facts, the shareholders would, he thought, agree that the trading profit of over £20,000, being an increase of some £6670 over last year, was not unsatisfactory. The profit and loss account indicated that the steady recovery of the business from the very serious position in which the Board found it at the reconstruction of the Company had not been arrested, even by the war. The figures for the four years of the present Company were: 1912, trading loss, £4345; 1913, trading profit, £5694; 1914, trading profit, £13,461; 1915, trading profit, £20,134. The trading for the current year was shaping as well as, under all the circumstances, could reasonably have been expected. The dividend on the shares in B. Cars, Limited, £7040, was the most pleasing item in the profit and loss account, and more than justified the judgment of the Directors in negotiating the acquisition of this business two or three years ago, and at the same time securing for the Company the valuable services of their present Managing-Director. In 1913, he said at the meeting that the Directors believed this investment was likely to prove satisfactory. He hoped the shareholders would agree with him that this modest statement had been more than verified. This handsome dividend was the more opportune at the moment in the absence of the receipt of any dividend whatever from the Austrian Company, from which last year they received £7358. It had been ascertained that a dividend of 5 per cent. on the Austrian Company's shares was declared in December last; but for obvious reasons, no part of it had reached this country. On the debtor side of the profit and loss account, repairs and depreciation of property, plant, and furniture were somewhat up; but where one was dealing, among other things, with a large quantity of intricate machinery and plant requiring replacement or renewal, it became necessary to make adequate provision, which, to the best of the judgment brought to bear upon the matter, had been done in this case. With regard to the balance sheet, the item of goodwill, patents, &c., of the Company's business was still further reduced by the profit on the debenture stock redeemed, and it now stood at the comparatively moderate sum of £7508. The figure representing the Austrian shares was one which must give cause for reflection. Even if they knew when the war would end, they would have very great difficulty in forecasting what would be the actual value of these shares when peace came. With regard to the freehold property, he mentioned in his speech last year that additions and alterations were being made, which were in this year's balance-sheet represented by the item of £10,731. The alterations gave an addition of nearly 30,000 feet of floor space, besides lifts, cranes, and labour-saving devices, greatly facilitating the conduct of the business; and they had let to Lloyds Bank on lease, at a handsome rental, the old show-room and part of the basement. Stock in trade, £25,637, was down to the extent of about £9000. With regard to investments, it was felt right to support the War Loan of last year by subscribing £5000, and again this year by applying for a similar sum, which, with the addition of 5 per cent. cash, would give conversion rights over the holding in the old War Loan. With reference to Consols, the question of converting these would in due course be considered by the Board, in consultation with the Trustees. As to the cash on deposit, it would be observed that they had succeeded in obtaining both the £15,000 from the Dresdner Bank and the £12,500 deposited with the Commerz und Disconto Bank, about which some questions were asked last year, and the recovery of which involved special vigilance and activity. On this topic he could enlarge, only it would take up some time; but the story of the recovery of the money was an interesting one, and he hardly thought it was likely to be repeated. At any rate, it resulted in £13,500 of hard cash coming over from Germany to this country within the last two months; and on this achievement he claimed the Board merited the support of the shareholders. The last item on the right-hand side of the balance-sheet, £65,000, representing commission in relation to the reconstruction, was one which, in the interests of the strength and stability of the Company, the Directors would like to see gradually written-down. Some questions were asked last year about the purchase of larger amounts of debenture stock, instead of placing money on deposit; but they would have done much worse for the Company had they, during the earlier years, sunk more of the available cash in procuring debenture stock at the prices then ruling, and would have jeopardized the commanding position which their cash resources had given them throughout a period of very considerable financial difficulty and constantly changing aspect. Speaking generally, the future was still a matter of uncertainty and gravity; but if there was any one thing as to which one was justified in feeling fairly sure it was that there would be a serious shortage of capital in this country, and that a commercial concern with sufficient cash resources would have a better prospect of weathering the storm than those that were pinched with poverty. On the other side of the balance-sheet, the debenture stock outstanding had been reduced to £212,522; the purchases during the year amounting to £5606 nominal. The deferred liability to pay for goodwill had been reduced from £12,500 to £10,735; and, lastly, the balance of profit and loss was £5708. In view of what he had already stated as to the necessity of conserving the resources for the present, and having regard to all the facts appearing on the balance-sheet, and to the obligations as regarded debenture stock and sinking fund, he felt sure that the proprietors would support the Board in the view that this sum should be carried forward. Of the hands employed at the Company's factory and in their different branches, to the number of some 800, it was not unimportant at the present juncture to note that a very large proportion were women; so that to this extent their demand for labour was not competing with the military requirements of the Empire. Of the male staff, a large proportion of those available for military service had enlisted. Encouragement had been given to them to do so; due provision having been made for their dependants, and for their resumption of work if (and when) they were able to do so—as it was hoped they would be. Most of the shareholders were doubtless aware that the Company had contracts from time to time with the great Government Departments, besides the chief railways, municipal corporations, and others; but it might interest them to know that they had recently installed some plant and machinery which placed them in a position to deal with munitions of war. The Board regretted that Major Pringle, now in command of Drake's Island, Plymouth, was unable to be present; and, while referring to the Directors, he alluded with satisfaction to the fact that Mr. Charles Lock, whose financial and commercial experience were most valuable to the Company, had yielded to a request that he would place this experience at the disposal of the Company as a Director.

Lieut.-Colonel C. M. Crompton-Roberts seconded the motion.

Mr. A. King remarked that the balance-sheet showed, to his mind, that the Company was really more of an investment company than a trading or manufacturing one. Of the investments, far and away the largest part was in the Austrian Company. Now, whatever might be the result of the war, one thing was certain—and this was that anything in the nature of cordial relations between Germany and England would be for a long time undesirable ["Hear, hear."], or even impossible. Would it not be possible to take this opportunity to get rid of this large Austrian asset? The Chairman had said that one of the things which would have to be faced in the future would be a shortage of capital in the country. Which would it be better to have at the end of the war, £179 000 in cash or shares in the Austrian Company?

The Chairman said he thought they would all agree that £179,000 in cash would be a matter deserving of favourable consideration, if they saw it on the table in front of them; but as it was not there, he could merely promise that the subject would be kept in mind by the Board.

The resolution was then carried unanimously.

On the proposition of the Chairman, seconded by Mr. B. Cars, Mr. Charles Lock was re-elected a Director.

Mr. Lock, in acknowledgment, said he had accepted a seat on the Board at the urgent request of the Chairman, backed-up by Mr. Cars. For a long time he had taken a keen interest in the Company's affairs, and particularly in the re-building of the premises in the Gray's Inn Road. This work had been designed and carried out in a manner which would ensure the efficient working of the business.

The meeting concluded with the re-appointment of the Auditors (Messrs. Deloitte, Plender, Griffiths, and Co.).

ACCRINGTON GAS AND WATER BOARD.

Annual Report of the General Manager.

In his nineteenth annual report to the Chairman and members of the Accrington District Gas and Water Board, Mr. Chas. Harrison (the General Manager) says that, in addition to the adverse circumstances operating generally, the district of the Board has been heavily hit by a long strike, and by the unsatisfactory state of the cotton industry. Of the total decrease of £1740 in gas-rental, the falling off in consumption by manufacturers (11,243,000 cubic feet) is responsible for £1489. In addition, a drop of 2s. per ton in the price of coke reduced the receipts by over £2000. Repairs cost £1971 more, and other items brought the total reduction in receipts to £7361. In the twelve months, the number of consumers increased by 259.

The report of the Auditors is appended; and this shows that the capital expenditure on the two undertakings during the year ended March 31 amounted to £3733. Beyond this an outlay of £2187 has been made on the renewal of the retort-benches at the Great Harwood works, which is to be written-off by three yearly instalments. The accounts show that during the year the carrying on of the undertakings has resulted in losses on the gas undertaking of £5167, and on the water undertaking of £150, making together £5317, as against a profit for the previous year of £2752. The receipts have decreased to the extent of £6278; while the expenditure is £287 in excess of the previous year, in addition to which the fixed charges have increased by £1505. The total expenditure on the gas undertaking is only decreased by £84; a saving of about £1000 in the cost of manufacturing gas being absorbed by increases in the other items of charge in that undertaking. The leakage of gas, between the amount made and sold, stands at 10 8 per cent. of the total production, after allowing the usual 1·25 per cent. for gas used at the works.

WARRINGTON GAS AND WATER UNDERTAKINGS.

Reduced Profits for the Year.

The annual report of the General Manager (Mr. W. S. Haddock) to the Gas Committee on the working of the Warrington Corporation gas undertaking for the year ended March 31 expresses regret that the profits have fallen to less than £4000; this decrease having rendered necessary an increase in the price of gas by 5d. per 1000 cubic feet. After expressing the hope that the increase in price will only be temporary, Mr. Haddock points out that most goods are much increased in price, some being double the former rate.

The gross profit for the year amounted to £11,360, and the net profit (after allowing £4414 for interest and annuities, and £3143 for sinking fund contributions) to £3988, as compared with £8619 twelve months ago. The net amount received in respect of gas sales was £59,157, a decrease of £361; while meter-rental receipts yielded only £48, a drop of £580 on the year. This is explained to some extent in the report. It is pointed out that the demand for meters has fallen off, and shows considerable reduction in both expenditure and receipts; the large purchase of meters in 1913 having enabled the management to effect considerable saving—the costs under this head being the lowest since 1887. Dealing with residual products, the revenue from coke amounted to £15,709, as against £15,295, or £413 more than last year. Tar produced £165, or £19 less than 1914. But the largest reduction was in tar products, which yielded £4170, compared with £5325 a year ago, a reduction of £1154. The receipts from sulphate of ammonia were £5941, against £6811. The total yield from residuals amounted to £26,286. The report states that the reduced yield from tar products and sulphate of ammonia is caused by the lower price realized for the various products. The gas-fittings sold and work executed during the year yielded £1119, as against £1159 last year; miscellaneous sales £752, as against £861; rentals of cookers, £530, compared with £542 a year ago; and rents of cottages and land, £232. The total income was £88,127 for the year, as against £91,019 for 1914.

Dealing with the cost of manufacture. Coal and cannel (including benzol) amounted to £33,787, being £1385 more than last year; while carbonizing wages amounted to £8983, or £1440 over that of 1914. Repairs and maintenance of works and plant totalled £7635—an increase of £602 on the previous year's figures. Another heavy increase was in insurances and compensation, which amounted to £1125, or £757 more than the expenditure under a similar heading in 1914. The report explains that the heavy expenditure on coke (including labour and cartage), £1847, or £954 more than last year's figures, was caused by having to store an unusually large stock, which had to be handled twice. As already stated, the expenditure on meters (with repairs and maintenance) showed a considerable reduction on the year, being £2307 down; while the wages of meter inspectors (and clothing) amounted to £1391, a drop of £98 compared with the 1914 figures. Retorts and settings cost £952, or £67 less than the previous year; while mains and services (including repairs and maintenance) totalled £2450, against £3404 twelve months ago, a drop of £954. Lamp repairs and maintenance cost £43 less on the year; but this was more than counterbalanced by an increased expenditure of £66 on lamp-lighting. Cooking ranges, repairs, and maintenance accounted for £1477, against £1288; while the expenditure on tar and tar products manufacture amounted to £478, against £588 for 1914—sulphate of ammonia manufacture being put at £1524 for 1915, as against £1450 for last year. Salaries accounted for £2859, a slight increase of £25; the total expenditure being £76,766, against £74,885 last year. The net increased total expenditure amounted to £1880, whereas the net decreased receipts were £2891.

As to working results, the coal and cannel carbonized during the year amounted to 55,462 tons, as compared with 51,522 tons the previous year; the gas made being, respectively, 561,697,000 cubic feet and 549,553,000 cubic feet—the increased make (12,144,000 cubic feet) being equal to 2·2 per cent. on the previous year's production. The gas made per ton of coal for 1915 was 10,127 cubic feet, compared with 10,666 cubic feet for 1914; the gas sold and accounted for during 1915 being 533,177,355 cubic feet, compared with 519,707,029 cubic feet last year. Unaccounted-for gas totalled 28,519,645 cubic feet, against 29,845,971 cubic feet for 1914. The average illuminating power was 16·11 candles.

The wages cost per 1000 cubic feet of gas made worked out at 10 283d., as compared with 9·394d. for the previous year. The cost of accounted-for gas into the holder was 13 663d., as compared with 11·194d. for 1914; while the cost delivered at the consumer's meter was 20·282d., as compared with 19·143d. The average price paid for coal and cannel during 1915 was 11s. 7·9d. per ton, against 11s. 11·5d. in 1914.

The gross income of the water-works undertaking for the period named was £31,987, against £33,029 for the previous year. Expenditure amounted to £11,735, an increase of £557 over the preceding year. The gross profit is given as £20,252, compared with £21,851 for the year 1913 14. After making provision for loan charges, the net profit on the year is £240, against £2012 for the previous year. It is pointed out that the income generally has been normal; last year's figures including £1137 for work done in connection with Warrington Bridge. The net profit has been carried forward, making the balance £7100; while the reserve fund, with the aid of £176 for interest on investments, has been brought up to its maximum of £10,000. During the year the capital expenditure has been £2679, and the amount of £6000 sanctioned in 1910 for the provision of new mains has now been expended. The loans repaid during the year amount to £6547; leaving a debt outstanding of £392,209.

YEAR'S WORKING AT BURTON-ON-TRENT.

The report of the Committee on the working of the Burton-on-Trent gas undertaking for the year ended March 31 (which is signed by the Chairman, Alderman T. E. Lowe, J.P.), shows that the total revenue for the twelve months was £66,295, and the working expenses £54,854. The salaries and wages bonus on profits came to £349; the gross profit being £11,092. After meeting loan charges and other items (including £3102 for new meters, stoves, &c.), there was a net profit for the year of £3561, as compared with £6263 for the preceding twelve months. This surplus has been allocated to the relief of the rates. While regretting that the result of the year's working does not compare favourably with those of recent years, they point out that, owing to the war, "business" has, with regard to gas undertakings, been far from "as usual."

Contracts were let in May, 1914, for the extension of the new retort-house, and for re-setting seven out of the ten beds in the first section erected in 1910. The work was to have been completed in August, and would no doubt have been ready within about six weeks of that time; but as soon as war broke out, contractors pleaded difficulty in obtaining workmen and proper delivery of goods, which resulted in the new beds not being brought into use until December. In addition to this, a number of the regular hands enlisted, and could not be replaced by men with the same aptitude for retort-house labour. The result was that gas making had to be continued in the hand-worked retort-house, with a class of labour not equal to the usual standard, and for a much longer period than was anticipated at the beginning of the year. A good deal of the loss might be attributed to these causes. Then the coke market was heavily depressed for some months after the outbreak of war, thus not only bringing down selling prices, but involving considerable additional expense in stacking it in the yard. Other items which had affected the net profit were the increased loan charges in connection with the extensions and the advances in wages, &c., granted in April, 1914.

According to the terms of the profit-sharing scheme which came into operation at the beginning of April last year, a bonus of 2½ per cent. would now be paid on the total salaries, wages, sick pay, and accident pay of the 215 employees of the Gas Department with three months' service or more. The earnings which participate in the bonus amounted to £13,954, on which 2½ per cent. represented £349.

The quantity of gas sold last year was 425 million cubic feet, and the number of consumers 11,852. With a total capital expenditure of £270,848, the outstanding debt is £45,167. The unaccounted-for gas was 4 68 per cent., against 4·8 per cent. in the preceding year. The average price received for gas was 2s. 2·06d. per 1000 cubic feet.

When submitting the report to the Town Council, Alderman Lowe pointed out that there was a decreased yield of gas per ton of coal, due chiefly to the fact that it had been necessary to manufacture gas in the old house, from which such good results were not obtainable. Residuals also had slumped. He hoped no member of the Council would attribute the drop in the profits to the management, by whom every care had been taken to secure the best results. Coal prices had been higher than was anticipated. The figure averaged 6s. per ton more than last year. When the Committee asked for an increase of 6d. per 1000 cubic feet on the price of gas, they anticipated an advance of 5s. per ton for coal; but it had gone up 1s. more. These facts would militate against the prospects for next year.

In the subsequent discussion, Mr. Bassett said it was a matter for congratulation that the gas sales were the largest on record in the history of the works. The returns were £633 in advance of any other year. The profits were only £3561, which was the lowest since 1894, and, with but one exception, the lowest for 35 years. He found there was a total capital outlay of £270,000, for which the ratepayers were only getting a return of £3561. For his own part, he could not say that he was satisfied. There had been a considerable quantity of gas sold for power purposes at cost price, and some for less than cost price. The actual net cost of gas worked out at 19·91d. per 1000 cubic feet. Gas was, however, sold at 1s. 6d. per 1000 cubic feet, and as low as 1s. 3d. How could a profit be expected? He trusted something would be done to remedy the inequality between the cost price and the actual selling price.

It was pointed out by Mr. Hutchinson that the position to-day was not due to cheap gas, but to the increased expenditure, which was owing to the extraordinary circumstances created by the war. He asserted that when the price of gas was 6d. cheaper than it was to-day the undertaking made much greater profit, which showed that the decreased profits were not due to the advocating of cheap gas. Contracts for coal had been entered into by the Committee at the 6s. increase; but some contracts had been resumed at an increase of 4s. 9d. The Government were considering action to lower the price of coal; but the Committee had made their bargain.

In reply, Alderman Lowe agreed that the position was not due to cheap gas. Apparently the gas cost more than the price at which it had in some cases been sold; but this was if they took into consideration the whole charges of 19·91d., which included rates, rents, and fixed charges.

CAPITAL DEPRECIATION IN SCOTTISH GAS-WORKS.

Plant, Stoves, Meters, &c.

At a recent meeting of the Dundee Gas Commissioners a point was raised to the effect that no depreciation had been written-off gas stoves, fires, meters, &c., nor had the idle plant at the Broughty Ferry Gas-Works (recently taken over by Dundee) been duly considered. Consequently, Mr. Alex. Yuill, the Engineer and Manager of the Dundee gas undertaking, prepared and submitted to the Commissioners an exhaustive report on the whole subject, some extracts from which will be of interest in other quarters where similar questions may arise.

Mr. Yuill pointed out that at the end of the last financial year the capital value of the Dundee gas undertaking amounted to £429,363—a figure entirely unrepresentative of the actual and potential value of the undertaking as a going concern. Under normal market conditions, works capable of producing 1200 million cubic feet of gas per annum could not be constructed for less than £792,000—being equal to £660 per million cubic feet; and this amount, compared with the present written-down value of the undertaking, £429,363—even ignoring a sum in lieu of goodwill—shows a difference of £362,637 in favour of the department. On this basis of computation, it proves that the gas undertaking as a whole has been already depreciated through the sinking fund to the extent of £362,637; and compared with this estimate the actual total contributions to the sinking fund since the works were acquired in 1869 amounts to £376,776.

During the current year, he says, the payments to the sinking fund will amount to £17,900; and at this rate of redemption the entire capital debt of the undertaking (the Broughty Ferry works included) would be redeemed in less than 24 years—equal to a rate of 4·17 per cent. per annum.

He has prepared a table showing that on the last two occasions when borrowing powers were obtained, the periods of repayment were fixed at twenty-five years and twenty years respectively, and this notwithstanding the fact that the capital involved had steadily fallen from £1278 per million cubic feet of gas delivered in 1870 to the very low figure of £381 per million cubic feet in 1914, at which time the Secretary for Scotland reduced the period of redemption to twenty years.

To show that the Dundee gas undertaking is carefully guarded in respect of the rate of its capital redemption, Mr. Yuill mentions that a few months ago a corporation—while the construction of new works was proceeding—obtained parliamentary authority to redeem their capital indebtedness in forty years.

The fixing of twenty years (or a rate of 5 per cent.) for the redemption of loans means that capital debt is redeemed through the operation of the statutory sinking fund long before average gas-works plant becomes obsolescent. Under such circumstances, Parliament does not ask municipal gas undertakings to depreciate—this being fully provided for in the sinking fund.

The report continues: When discussing the question of depreciation, it frequently occurs that the financial operations of a private trading company are confused and identified with those of a municipal department, such as a statutory gas undertaking. To illustrate the difference, let us suppose that two gas companies have amalgamated, and that the purchasing company has decided to close-down the manufacturing station of the smaller company. In this case, a special depreciation fund is created to liquidate the value of the obsolescent plant. The absence of such a fund from the accounts of a gas undertaking is erroneously ascribed to bad finance. As a matter of fact, the property of a gas undertaking is more regularly depreciated than that of a private trading company, because it is bound by Statute not only to maintain the works in a good state of repair, but also to redeem the capital debt in a given number of years. In other words, the sinking fund of a gas undertaking is equivalent to the depreciation fund of a trading company; and, it may be added, the interest paid to annuitants, and for borrowed money, is to all intents and purposes equivalent to a trading company's dividend.

Mr. Yuill submits a statement as to the make of gas, capital charges, &c., at seven large Scottish works, which shows that Dundee compares very favourably with the other places in regard to its capital indebtedness, &c.

With regard to the Broughty Ferry Gas-Works, statistics are furnished to show by comparison how cheaply the works were acquired. At the present time the net capital indebtedness stands at £32,673; being equal to £435 per million cubic feet of gas sold. Had the works been acquired from a gas company, the cost, Mr. Yuill points out, would not have been less than £1000 per million; and under the Gas Supply (Scotland) Act it would have taken forty years to liquidate the debt by the operation of the sinking fund. To redeem the present capital debt of Broughty Ferry an annual sinking fund charge of £1412 is required, according to Statute. At this rate of redemption, the capital debt will be completely wiped out in twenty-three years—being equal to a rate of 4·32 per cent. per annum. Thereafter, it will only be necessary—so far as the Broughty Ferry works' capital is concerned—to meet the annual charges for the acquisition of annuities and the payment of annuitants in conformity with the Statutes.

The real point at issue, the report resumes, is: "Should the value of the idle plant and apparatus at the Broughty Ferry Gas-Works be written-off more rapidly than the plant still of service and in daily use?" To enable a decision to be arrived at, he has examined the idle plant, and estimates the value of it at about £10,500. The amount which may be set aside as depreciation, &c., can only be provided at the expense of the gas consumers. Therefore, in considering this question, it should be noted that any increase in the rate of capital redemption, either by depreciation or otherwise, would be immediately followed by an additional charge on the revenue of the department for local and Imperial taxation. Should the Commissioners decide to set aside an annual sum to wipe-out the amount, in addition to the existing statutory sinking fund of £1412 (which should suffice), then the department would be called upon to bear the burden of a voluntary and non-statutory revenue charge, *plus* an additional amount for taxation incident upon revenue having to be raised to meet these additional charges.

For example, each £1000 set aside for depreciation, out of current revenue, costs the department an additional sum of £375 for rates and taxes. That is to say, £1000 becomes £1375, which is equal to a premium of 37½ per cent.

The following statement shows the probable financial aspect of the question, and how it affects the revenue account:—

(1) Depreciation on gas stoves and fires calculated at 10 per cent. on the present value	£5108
(2) Depreciation of the idle plant at the Broughty Ferry Gas-Works (say) £10,000, repayable in five years	2000
	£7108
(3) Extra for local and Imperial taxation at (say) 7s. 6d. in the pound	2665
Total	£9773

This represents a sum equal to 2·18d. per 1000 cubic feet of gas sold.

The following statement shows the sums taken from revenue (independent of sinking fund) for the depreciation of meters, stoves, fires, and new works during the undermentioned period:—

1902-03	£6,728	13	6
1904	5,386	0	7
1905	3,795	3	9
1906	4,596	4	4
1907	2,964	15	0
1908	5,620	7	9
1909	4,676	8	0
1910	2,946	19	5
1911	7,529	14	2
1912	8,052	7	9
1913	4,176	13	11
1914	3,050	7	7
	£59,523	15	9

In conclusion, Mr. Yuill adds that the Gas Commissioners are under no statutory obligation to depreciate plant and apparatus. "Therefore, in view of the fact that by the application of the sinking fuud the entire outstanding debt of the gas department will be redeemed in twenty-four years, no real benefit can accrue from the proposal to still further tax the gas consumer at the present time."

In an appendix to his report, Mr. Yuill gives the following particulars as to transfers of Scottish gas-works to local authorities:—

Gas Undertakings Transferred to Local Authorities.

Year.	Town.	Gas Sold.	Price Paid.	Capital per Million Cubic Feet Sold.
		Cubic Feet.	£	£
1871	Aberdeen	110,000,000	162,500	1,476
1877	Alloa	18,160,000	23,250	1,287
1870	Arbroath	20,600,000	35,000	1,699
1914	Bridge of Allan	26,540,000	29,953	1,129
1910	Carnoustie	24,000,000	21,000	875
1873	Dumbarton	16,000,000	20,255	1,266
1870	Dundee	200,838,000	256,562	1,278
1888	Edinburgh and Leith	1,084,331,000	1,052,972	971
1895	Falkirk	52,639,000	85,267	1,620
1911	Fraserburgh	24,906,000	27,608	1,108
1869	Glasgow	962,950,000	869,062	902
1872	Kilmarnock	27,952,000	40,500	1,449
1910	Kirkcaldy	147,881,000	137,150	927
1914	Motherwell	104,975,000	135,987	1,295
1901	Newport (Fife)	9,814,000	10,500	1,528
1871	Perth	32,500,000	45,000	1,385
			Average	£1,262
	Broughty Ferry	£75,000	Outstanding Debt, £32,693	£435

GAS PROFITS AT BARNOLDSWICK.

Economies Effected with Vertical Retorts.

In spite of adverse circumstances, the operations of the Barnoldswick gas undertaking during the past financial year have resulted in more than a doubling of the profits of the previous year—due, in the main, it is said, to economies effected by the installation of vertical retorts eighteen months ago.

In his annual report, the Gas Manager (Mr. J. W. Thompson) remarks that on this occasion it is opportune to take a more general survey than has been customary in the past; for the reason that this year marks the completion of the policy of extensions adopted eight years ago. The employees had done their best to make the year a success. This was the first year it had been possible to carry out a thorough and searching test of the Glover-West vertical retorts, and to say the results exceeded anything anticipated a few years ago was only expressing what they now knew. The Contractors guaranteed to make 11,500 cubic feet per ton of coal, of the statutory candle power, which was very much above the average for coal gas. The actual make had been 12,355 cubic feet—not only above the statutory candle power, but of a constant and high calorific value. There was no doubt that every advantage claimed for the plant by the makers had been more than fulfilled. To make a full year's comparison of the working results of the verticals with the old horizontal retorts, it was necessary to compare the year under review with two years ago. The quantity of coal carbonized had been 6168 tons, against 6366 tons two years ago. This showed a saving of 198 tons, though the make of gas had been 12,909,200 cubic feet more. In the same periods, the wages paid for stoking were respectively £307, against £795, or a saving of £488. The department has assisted the ratepayers by contributing £750 to the district fund; otherwise there would have been an increase of 4d. in the pound on the rates. The unaccounted-for gas was 4·6 per cent.

For the previous year the profits were a record of £1263; but on the present occasion they have bounded up to £2630. "This," proceeds Mr. Thompson, "is a feature that requires no further comment. With such excellent results, some may be tempted to ask: 'Why not reduce the price of gas?' Well, for many reasons; the chief of these being that we are confronted with a possible increase in the cost of coal to the tune of £1800, and also a probable reduction in the value of residuals. We are fairly strongly placed to go through the current year with gas at the same price; and this is a valuable asset to the town. It is necessary to reconsider the price of coke, which is being sold considerably under its market value. There are no immediate hopes of making further economies in carbonizing, handling of coal, and residuals; so that we only have one field open to us—that is, suitable plant for making our residuals more valuable, which will be introduced at an opportune time."

TYLDESLEY GAS SUPPLY.

The Past Year's Working Results.

There has just been issued the annual report of Mr. Hedley Hoy, the Manager of the Tyldesley-with-Shakerley Urban District Council Gas and Water Department, giving the working results for the year to March 31.

In the Gas Department the total receipts amounted to £9490, and the expenditure to £7384, leaving a gross profit of £2106. Out of this sum, £2010 has been paid for interest and sinking-fund charges (equivalent to 9·67d. per 1000 cubic feet of gas sold), leaving a net profit on the year's working of £96, which has been carried forward—making the balance carried forward £3101. The reduced profit was said to be due to the decreased receipts from the sales of residuals. The expenditure on capital account was £493. The amount of loan capital owing at the commencement of the year was £14,103, £800 was added during the past year, and £1415 was paid off—leaving £13,487 outstanding.

The total gas made was 60,116,000 cubic feet, of which 1,465,000 cubic feet was carburetted water gas. The increased output was 1,046,000 cubic feet, or 1·74 per cent., as against an increase of 8 per cent. the previous year. The make of gas per ton of coal carbonized was 10,838 cubic feet—a slight decrease on last year. The gas consumption was 49,906,000 cubic feet—an increase of 823,000 cubic feet, or 1·65 per cent. The amount of gas used by prepayment consumers showed an increase of 1,991,700 cubic feet; but against this, there was a decreased consumption in the case of ordinary consumers for lighting of 1,329,900 cubic feet. The amount collected from prepayment meters was £2308—an increase of £301. The average price obtained through these meters was 3s. 3·1d. per 1000 cubic feet. The average annual consumption per consumer was 8921 cubic feet. The unaccounted-for gas was 15·4 per cent., against 14·9 per cent. last year.

The average cost of coal was 12s. 5·82d. per ton, being 4·13d. per ton less than the past year. Coke returned 4s. 4·88d. per ton of coal used, and tar and liquor 2s. 8·37d.—making the return for residuals 7s. 1·25d., or equal to 56·90 per cent. of the cost of coal.

The usual repairs to mains and services, in consequence of subsidence, also the renewal of old and leaky services, occupied considerable time and attention. The repairs and maintenance of works carried out included the resetting of one bed of retorts, and the provision of new mouthpieces for same.

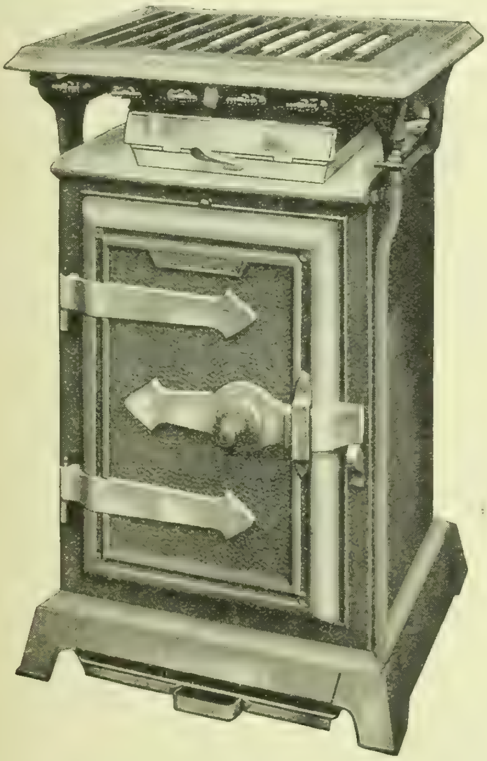
PROFIT-SHARING AT BURTON-ON-TRENT.

The System Explained.

A profit-sharing scheme was inaugurated by the Gas and Electricity Committee of the Burton-upon-Trent Corporation, to come into operation as from the beginning of the past financial year. In explaining the principle to the men, the Gas Manager (Mr. R. S. Ramsden) says the object of the scheme is to give all the employees of the Gas Department an inducement beyond their salaries or wages to take a greater interest in their work and in the welfare of the undertaking. The principles on which it is based are:

That when the total net expenditure for manufacturing (less the receipts from residuals), distribution, and all other charges, exclusive of interest and repayment of loans, shall be, in any year, less than 2s. per 1000 cubic feet of gas sold, then the employees of the Gas Department shall be entitled to a bonus on the salaries, wages, sick pay, or accident pay received by them, calculated at the rate of ½ per cent. for every 1d. or fraction of 1d. below the said 2s.

That the distribution of bonus shall be *pro ratâ* on the sums actually



Main Munitions.

THE most important munitions in your Summer campaign are Cookers. Every care is exercised in the manufacture of "Main" Cookers so as to ensure their giving the highest possible efficiency. Their range covers all contingencies. There is originality in the treatment of detail consistent with effectiveness and with an eye to economy in replacement. Make them your allies in advancing your summer sales.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N. Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

received by the employees during the year, and shall be paid after the annual accounts (which are made up to March 31 in each year) have been adopted by the Gas Committee. That no bonus shall be divided among the employees who shall have been employed in the department for less than three months during the year in which the bonus has been earned. The Committee have power to withhold the bonus from any employee who, in their opinion, is not deserving of the same, owing to inefficient work, indolence, or misconduct.

On the basis set forth, the bonus for the year 1913 would have been 5½ per cent. The wages and salaries for the year amounted to roughly £10,000; and 5½ per cent. on this would have been £550. Taking the case of a man whose wages averaged 25s. a week, or £65 for the year, 5½ per cent. represents £3 11s. 6d.

It is up to every man and youth in the employ of the Gas Department, in his own interest, therefore, to strive his utmost to work the undertaking more economically and efficiently. Each employee should have a good idea how to employ his time and the materials which he uses to the best advantage; and when he sees that salaries and wages, or, in other words, expenditure on time, amount to about one-half of the net working expenses, he will realize that time is the most valuable commodity with which the gas undertaking has to do.

LIVERPOOL CORPORATION WATER SUPPLY.

When the European war broke out, at the beginning of last August, the Liverpool Water Engineer, Mr. J. R. Davidson, being a Major (now Lieut. Col.) of the 10th Battalion, King's Liverpool Regiment (Liverpool Scottish), was called away to active service with His Majesty's forces. On Aug. 11, the Consulting Water Engineer (Mr. J. Parry, M.Inst.C.E.), who had retired on May 30, 1914, took over Mr. Davidson's duties for the period of his absence. Under the circumstances, it appeared undesirable to prepare an annual report in the form hitherto adopted; and on the recommendation of the Consulting Engineer, the Water Committee approved the omission, and authorized the separate printing of the annual statistics and statements of work done, to maintain the continuity of the records.

These show that the average quantity of water supplied per day in the year ended Dec. 31 was 39,344,000 gallons, and the mean population served was 1,189,886. The corresponding figures for 1913 were: Average per day, 37,163,000 gallons; population, 1,174,555. The increase in consumption for the year, therefore, was 2,181,000 gallons per day. The quantity of water supplied in the compulsory area was 12,508,947,000 gallons, or at the average rate of 37·013 gallons per head per day. Adding the outside area made a total of 14,321,230,000 gallons. The sources of water were: Vyrnwy, 8,763,980,000 gallons; Rivington, 4,327,623,000 gallons; and wells, 1,229,627,000 gallons. The number of new water tenants added during the year within the compulsory limits of supply was 1308; and the length of new mains laid was 4 miles 1041 yards. There were 117,805 inspections made for the detection of waste; and 28,018 defects were discovered. Of these, 7128 were repaired at the time of inspection.

With regard to new works, early in 1914 the Committee authorized the Engineer to proceed with the preparation of plans for the construction of two new filter-beds at Oswestry, to meet the increasing demands for Vyrnwy water in Liverpool. Mr. H. N. Giles, who was appointed to assist in the preparation of the plans, had completed the preliminary surveys, when he was called away to join the forces, having previously held the rank of Captain in the 1st Volunteer Battalion of the King's Liverpool Regiment. In connection with these works, a contract was entered into in October for 640 yards of 30-inch cast-iron pipes to be laid from the Llanforda reservoir. The existing filtration works for supplying the town of Chorley having been found inadequate to maintain an efficient and constant service during the summer months, designs for a new filtered-water tank were submitted to, and adopted by, the Committee. Application was made to the Local Government Board for sanction to borrow the necessary capital; and this sanction having been obtained, tenders for the construction were invited. The outbreak of the war caused some delay in commencing operations; but the Contractors made a start in September, under the supervision of Mr. A. S. Mason, as Resident Engineer. In November, the Committee authorized the Engineer to obtain tenders for a new pumping-engine and boiler required to meet the increasing demands for water in the town of Prescot.

The revenue last year on ordinary account was £386,835, and the expenditure £378,507.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

In submitting the statement of accounts for the year ended May 15 last to the Edinburgh Town Council, Treasurer M'Michael pointed out that in the Common Good account the surplus for the year was £4560. While there were no exceptional features in the items of revenue or expenditure, the cost for public ceremonies and entertainments was up to the average of recent years, even though such functions had been practically suspended since the outbreak of war. This circumstance, the speaker pointed out, was to an extent accounted for by the somewhat lavish hospitality extended last July to a large and representative party of German Burgomasters—"one more proof of our native guilelessness, and our absolute unpreparedness for war." Dealing with the ordinary police accounts, he said that at the beginning of May last they were sufficiently assured of savings in certain departments, due mainly to the postponement of work sanctioned, to justify him in putting the unexpended balances at £15,000. The Council would be gratified to

Prestige

"The foundation of prestige," says a writer, is "ACHIEVEMENT." In 1911, we invented the Hygienically Perfect Gas Fire; in 1912 we devised the Shadowgraph Test of Hygienic Efficiency in Gas Fires; in 1914-15 we established the first complete Permanent Gas Exhibition. . . . Our prestige now stands higher than it has ever stood—and we intend to enhance it.

The Gas Exhibition Salons
60, Oxford St, London, W.

THE DAVIS GAS STOVE Co Ltd

know that the total surplus at the close of the year amounted to no less than £31,000—the year having been begun with unexpended balances of £20,000. This result had been brought about by economies effected in practically all the large spending departments, and by savings on interest; there having been no increase in the estimated yield from the burgh assessment. Primarily, he attributed the result to the prudence and foresight exercised by the official heads of their departments, who, from the outset of the crisis, and acting in conjunction with their Conveners, deliberately set themselves to delay all work capable of being postponed, and at the same time gradually reduce their staffs accordingly. On lighting there was a saving of £9000, brought about by the restricted service with which they had all become familiar.

Obviously, in connection with the position of affairs just quoted, no case is made out for the suspension of sinking funds during the war. But, as Mr. A. Canning Williams (the Treasurer of the Edinburgh and Leith Corporations' Gas Commissioners) pointed out in a letter read at a meeting of the Annual Committee of the Convention of Royal Burghs in Edinburgh last week, the suggestion to suspend the sinking funds is of great importance to certain branches of municipal enterprise—and applies with particular force to gas undertakings, inasmuch as they are trading concerns which feel the full brunt of increased prices for material, and are not in a position to economize, as is the case with some of the non-trading departments of a corporation, where by reduced expenditure a considerable set-off against additional outlay in other directions is secured. In the course of his letter, Mr. Canning Williams further pointed out that, owing to the very large additional cost of coal and other material, to war allowances and bonuses, and other exceptional expenditure due to the war, the Commissioners will be reluctantly compelled in the autumn to increase the price of gas. The annual contributions to the sinking funds of the undertaking are equal to 3½d. per 1000 cubic feet of gas sold; and, while their suspension would not render unnecessary an increase of price, it would reduce the amount of it to this extent, and so save the gas consumers of Edinburgh and Leith some £29,000 per annum. Under these circumstances the Commissioners trusted that the Committee would decide to take early action, and that it would be successful. At the meeting of the Committee referred to, a resolution was passed to the effect that the members generally were of opinion that, in the interests of sound finance, the suspension of sinking funds was to be deprecated; but they recognized that in some special cases the postponement of capital repayments might be expedient for reasons specially due to the war, and, on good cause shown, they recommended such action to the favourable consideration of the Scottish Office.

Mr. J. Napier Myers, the Manager of the Saltcoats Gas Company, Limited, is to be congratulated on the results of his working for the twelve months ended May 31 last. The Directors' report shows that the balance at the credit of the profit and loss account (after providing for depreciation of the works) amounted to £1584, which was apportioned as follows: In paying a dividend of 8 per cent., free of income-tax, amounting to £1280; in paying a bonus of 1 per cent., or £160; and carrying forward to next year £144. During the year the consumption increased by 2,160,000 cubic feet. It was pointed out that the carbonizing plant had been considerably increased by an extension of the retort-bench, which necessitated the removal of the old, and the erection of a new, chimney. Certain of the Company's mains in the central district had also been enlarged. The average cost of coal bought was 14s. 6d. per ton; and the gas made totalled to 35,240,000 cubic feet, or 10,170 cubic feet per ton of coal carbonized. There are 2785 consumers and 285 public lamps in the Company's district.

At the annual meeting of the Cupar Gas Company, the Secretary and Manager (Mr. James Macpherson) submitted the financial statement, which showed a profit on the year's working of £1336, to which had to be added the balance from the previous year, amounting to £105, making a total credit balance of £1441. It was recommended that £400 be written-off for depreciation, £29 allowed for Directors' and Auditors' fees, and £806 expended in dividends, leaving a credit balance of £206. The Chairman (Hon. Sheriff William Thomson) said the consumption of gas during last winter was a record one. The increase was chiefly attributable to Cupar having been made a military centre. The Directors recommended an increase of 9d. per 1000 cubic feet in the price of gas. Dividends were declared of 5 per cent., less income-tax, on the preference stock, and £2 per £30 ordinary share, tax free.

The annual report and balance-sheet of the Brechin Gas Company show the sales of gas for the year to have amounted to £5832, of which £2659 was through prepayment meters; while the income from residual products was £1059. After meeting all charges, a balance of £1783 was carried to profit and loss account, making, with the balance of £184 brought forward, a total of £1967 at the credit of the fund. From this there has been paid for preference share dividends and interest on debentures (less income-tax) £317, written off for bad debts £20, depreciation £250, new gasholder £50; leaving a net balance of £1330, which the Directors recommend should be allocated in the payment of a dividend of 18s. per share on the ordinary capital (less income-tax), £1215, leaving a balance of £115 to be carried forward, subject to such remuneration as may be voted to the Directors. A proposal is made, in view of the high price of coal, that the price of gas be increased for lighting purposes in the Brechin district to 4s. 4½d. per 1000 cubic feet, and 5s. 4½d. in the Edzell district; and for heating, cooking, and power purposes, to 3s. 9d. in Brechin, and to 4s. 9d. in Edzell.

The Castle Douglas Gas Company have fixed the price of gas at 3s. 9d. per 1000 cubic feet—an increase of 5d. The Company have decided to pay a dividend of 7 per cent. The Pitlochry New Gas Light Company have paid 5 per cent. dividend. Another Scottish Company—Renton—have also paid 5 per cent.; and the Vale of Leven Gas Company are paying 7½ per cent.

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Tar Products, Limited.—A joint-stock company having this title has been registered, with a capital of £12,000 in 10s. shares.

Gasfire Construction;

An Entirely New Principle!

FULL particulars of Richmond's new productions for the coming season will shortly be announced. They will form an epoch in the development of Gas as the universal heating medium.

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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 19.

Pitch continues quiet, and the price remains without change at 26s. per ton in bulk at makers' works. Other values are: Creosote 4⅛d. to 4¼d. net in bulk; 60's crude carbolic acid, 3s. 6d. per gallon net; 48-50 per cent. anthracene, 2¼d. per unit, casks free. Tar spirits are scarce; most of them being taken up for Government purposes. The tone of sulphate of ammonia continues good; there being no alteration in the price reported last week of £14 8s. 9d. per ton net into buyers' bags, at makers' works, for 25 per cent. quality.

Tar Products in the Provinces.

July 19.

The markets for tar products have remained fairly steady throughout the past week. The high prices being asked by the distillers is preventing business in pitch at the present moment. Solvent and heavy naphthas are fairly firm, though business is reported in the former at slightly lower prices. Creosote is weak, and difficult to sell. Crude carbolic maintains its price.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 6d. to 25s. 6d. Pitch, East Coast, 22s. to 23s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. to 24s. Clyde. Benzol, 90 per cent., naked, North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3d. to $3\frac{1}{16}$d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 6d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *July* 16.

Although the market for this article has remained rather quiet throughout the week, the tendency of prices in the near position has been to harden slightly. The volume of new orders from direct buyers has been less than that recently experienced, but all available supplies have been readily absorbed by middlemen. The nearest prompt values are now £14 13s. 9d. per ton f.o.b. Hull, £14 16s. 3d. f.o.b. Liverpool, and £15 1s. 3d. f.o.b. Leith. There has been no change in the situation so far as forward delivery is concerned, and the quotations are still £15 2s. 6d. f.o.b. Liverpool, and £15 5s. per ton f.o.b. Leith, for October-March shipment.

Nitrate of Soda.

This market is again firmer, and holders on spot now require 12s. 3d. per cwt. for ordinary, and 12s. 6d. for refined quality.

Sulphate of Ammonia.

From another source it is reported that, although this market has remained steady, the number of new transactions are not very large. Outside London, makes are still quoted at £13 15s.; Hull, £14 15s.; Liverpool, £14 17s. 6d.; Leith, £14 17s. 6d. to £15; Middlesbrough, £14 15s.

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COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is rather irregular, and the effect of the Limitation of Price Bill is beginning to be felt in some degree; but the largeness of the exports (which are exempted) will minimize the effect on some parts of the northern coalfield—that is, to the allied countries, to which licences are not needed. In steam coals, best Northumbrians are about 21s. to 22s. per ton f.o.b.—the Welsh crisis having given some stimulus, though it may be only temporary. Second-class steams are 16s. 6d. to 17s. per ton; and steam smalls are from 13s. 6d. to 15s. In the gas coal trade, the demand is steadier. Best Durhams are from 20s. to 21s. per ton f.o.b.; second-class gas coals are unaltered at 17s. to 17s. 6d. per ton; and "Wear Specials" are 22s. to 22s. 6d. per ton f.o.b. The freights are a little easier, based on about 7s. to 7s. 3d. Tyne to London. Some of the coal prices are likely to be materially affected by the duration of the Welsh strike. There have been few contracts for gas coals of late; but some large sales of Durham coals have been made to France, which will stiffen the market, and may thus influence the gas coal position. It is not anticipated that the new Coal Bill will much affect Durham coals, as contracts are usually long. The coke trade is steady. Gas coke is firm and scarce—shipments having been heavy of late, though, of course, below the average at this season. Stocks are generally low. For good gas coke, the current price is from about 27s. 6d. to 29s. per ton f.o.b. on the Tyne, with a fair demand.

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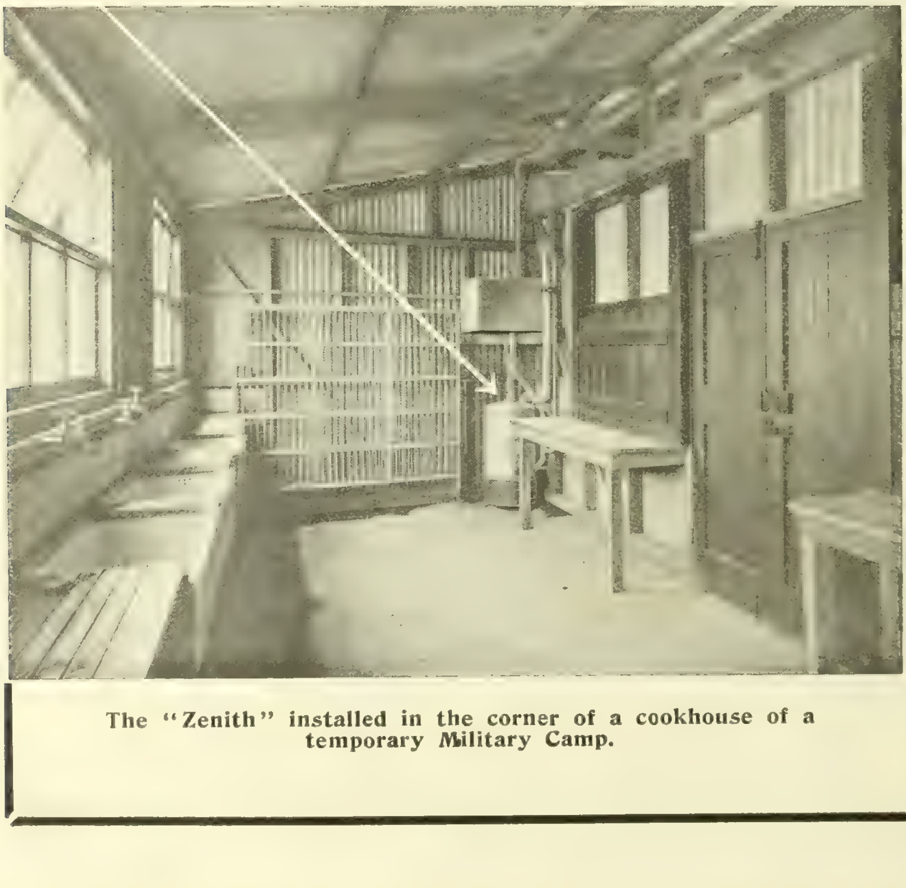
Bradford and the Price of Coal.—The Bradford City Council, in approving the Gas Committee's recommendations for the increase of gas prices, added the following: "And that, in view of the fact that the increased price of gas is largely necessitated by the extraordinary rise in coal prices, the Council urge the Government to give immediate effect to the recommendation of the Departmental Committee on Coal Prices, 'that if prices do not shortly return to a reasonable level, the Government should consider a scheme for assuming control of the output of collieries during the continuance of the war.'"

THE "ZENITH" GAS-HEATED BOILER



The "Zenith" installed in the corner of a cookhouse of a temporary Military Camp.

The "ZENITH" is a COMBINED HEATER and STORAGE-CYLINDER.

Therefore no heat lost between heater and cylinder.

Constant supply of hot water available at any moment, day-time or night-time.

Made in three sizes, 10, 20, and 40 gallons, each complete with Thermostat.

Manufactured by
ARDEN HILL & CO.,
ACME WORKS,
BIRMINGHAM.

Manchester Gas Department's Roll of Honour.

How well the employees of the Manchester Corporation Gas Department have answered their country's call is shown by the Roll of Honour, giving the names of those who had joined the Colours up to March 31 last. It contains no less than 502 names; and a summary appended shows that the various works and departments are represented as follows: Clerical staff (Town Hall), 31. Meter department —Ordinary, 24; automatic, 27; stores, 9. Stoves department, 77. Private lighting department, 5. Gaythorn station, 36. Rochdale Road station, 32. Bradford Road station, 111. Droylsden station, 2. Street mains and lighting department, 148.

Mansfield Gas Undertaking.

At a meeting of the Mansfield Town Council last Friday evening, Dr. Tarachand drew attention to the fact that, at the previous meeting, he directed notice to the circumstance that there was a deficiency in connection with the gas undertaking of £2000. It was interesting to know that since then a report of income and expenditure had been issued by the Gas Manager (Mr. W. J. Rendell Baker). The Mayor suggested that the matter ought not to be discussed at that stage, as there was to be a special meeting in regard to it. It would be as well if they waited until they had the Committee's report, which was not yet before them. Mr. Marriott asked whether, in view of the decision of the General Purposes Committee not to hold the ordinary meeting of the Council and Committees in August, the report would be presented at a special meeting of the Gas Committee, or whether they would have to wait until September to get the report. The Mayor thought that at the present juncture the discussion would be quite out of order. He understood there was to be a special meeting of the Gas Committee regarding the subject; and, in his opinion, there should be also a special meeting of the Council. The matter then dropped.

Gas Affairs at Heywood.—The printed minutes of the Heywood Gas Committee stated that at a recent meeting it was resolved that the wages of stokers be advanced to 5s. 9d. per shift without holidays, and the wages of sulphate workers to 5s. 6d. per shift. The minutes also stated the Committee resolved that henceforth the gas supplied to Belgian refugee homes should be charged for. In submitting the minutes for approval at the last meeting of the Town Council, Mr. David Healey, the Chairman of the Gas Committee, said both questions had been fully discussed in committee, as also had the question of coal contracts. They had now let the contracts for the coal required during the next twelve months. The average increase in price was 5s. per ton—equal to 5d. per 1000 cubic feet of gas. So far, they had only increased the price of gas to their consumers by 3d. per 1000 cubic feet, though many undertakings had increased their charges 6d. He hoped it would not be necessary to further increase the price, but three or four months' experience would show whether it was necessary or not.

Ossett Gas Finances.

At the meeting of the Ossett Town Council on Monday of last week, the Gas Engineer (Mr. A. E. Mottram) presented his fourteenth annual report upon the working of the gas department, which stated that 155,711,000 cubic feet of gas had been made in the year and 145,523,900 cubic feet sold, the respective increases each being a little over 8 million feet. The coal carbonized had been increased from 13,084 to 13,525 tons, and the gas made per ton of coal had improved from 11,290 to 11,512 cubic feet. Through ordinary meters there had been distributed 62,000,000 cubic feet, and through slot meters 35,443,000 feet. In all departments there had been increases, with the exception of gas used for engines. This was accounted for by the extent to which one large firm had been affected by the war. It was also entirely on account of the war that management expenses had gone up ½d. per 1000 feet of gas sold, that taxation was up to a similar extent, and that the receipts from residuals were down 3d. per 1000 cubic feet of gas sold. The mains had been extended to Midgley, and their length was now 56½ miles. There were 4570 consumers through ordinary meters and 4308 through slot meters. Alderman Harvey Robinson (the Chairman of the Gas Committee) said the financial statement would have been much more satisfactory if there had not been a decrease of £1474 in the revenue from residuals, in spite of the fact that nearly 800 tons more coke were sold than in the previous year. After paying a tribute to the ability and industry of the Gas Engineer (more especially in connection with the successful installation of a new vertical retort plant), he mentioned that one of the bye-products for which there had been scarcely any market was pitch, of which large quantities were exported to Belgium before the war. On this commodity alone the loss of revenue had been £650. Financial relief for the undertaking had been obtained by manipulating the sinking fund in a manner which could only be defended on the ground of the exceptional circumstances created by the war. It was not compulsory for a corporation to set aside any sum towards sinking fund in the first year of borrowing; but the Ossett Council set aside £1134 nine months after purchasing the gas-works in 1901, and credit had now been taken for this amount, after which there was only £63 to carry forward. With regard to the current year, the Committee had to face an outrageous and totally unjustifiable increase in the price of coal; and as there was such uncertainty as to the value of residuals and the extent to which the consumption of gas for manufacturing purposes would be affected by the war, he would not venture upon any prophecy as to the financial results which might be obtained. The report was adopted.

The question of the control of the gas supply in the event of fire in factories and workshops is being considered by the Chorley Town Council. The Gas Manager (Mr. J. W. Allin) has been instructed to approach owners of works where gas-valves have not been provided outside the premises, with a view to this precaution being taken. The Council will carry out the necessary work at cost price.

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FIRST IN 1889.

Any Coin.

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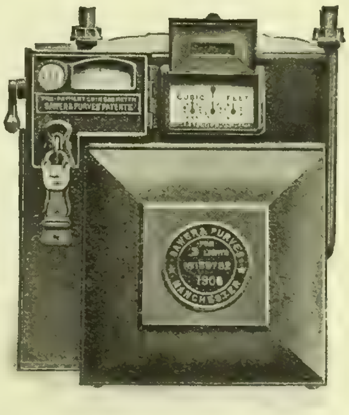

Hipperholme's Rebate to Consumers.—In these times of increasing prices, it is noticeable that the Hipperholme (Yorkshire) Gas Committee last week decided to grant a rebate of 1d. in 1s. to all prepayment consumers.

Wolverhampton Water Supply.—The Water Committee of the Wolverhampton Town Council, in their report on the undertaking for the year ended March 31, record a profit of £1107, which will be transferred to the improvement fund in aid of the rates. The water pumped was 2,795,000,000 gallons; and 14,941 tons of coal were consumed. Of 22,960 houses in the municipal borough, 22,812 are supplied with water from the Corporation works; while of those outside 15,625 are supplied. The daily average consumption last year was 4,006,986 gallons.

Increase in Price at Carlisle.—Discussion took place at last Tuesday's meeting of the Carlisle Town Council with reference to a proposed increase from 2s. to 2s. 4d. per 1000 cubic feet in the price of gas. Mr. J. P. Buck (the Chairman of the Gas Committee) said the year had been a record one as to the quantity of gas sold; and the cheap price had been highly appreciated. The Committee were, however, faced with the fact that coal would cost £9000 more; and if they did not raise the price of gas there would be a big deficit. Several members opposed the increase; but eventually it was carried.

Feltham Public Lighting.—A letter from the Brentford Gas Company, with reference to the proposed non-lighting of the street-lamps from June to August, was read at a meeting of the Feltham District Council last week. The Company stated that the actual value of the gas saved by adopting the Council's suggestion would amount to only £3 14s., and that taking all the circumstances into consideration they did not consider they ought to be called upon to make any allowance, as they were at present actually carrying on the lighting of Feltham at a loss. It was decided not to make any alteration in the existing public lighting arrangements.

Morley Gas-Works Results.—For the first time for many years, there has to be recorded a loss on the year's working of the gas undertaking of the Morley Town Council; the deficit being £1254, as compared with a net profit of £851 for the previous year. The results were, it is stated, seriously affected by delay in the completion of new carbonizing plant. Sales of gas, at 118,456,600 cubic feet, showed an increase of 7,187,700 feet over those of the preceding year. While it is seen to be inevitable that the price of gas should be advanced sooner or later, on the other hand substantial savings are expected to result from the use of the new plant. A Sub-Committee has been appointed to make re-arrangements of the staff for the management of the works in the absence through illness of the Manager, Mr. R. B. Botterill.

Lighting Matters at Elstree.—Speaking in respect of the lighting of the parish at the meeting of the Elstree Parish Council last week, the Chairman (Mr. F. De'Ath) said that, as they were now aware, the Gas Company, without the authority of the Council, did not light the parish lamps for a considerable period last year. He was not quite sure that the failure to fulfil their obligations on the part of the Company did not break the contract. He was quite aware they acted on the instructions of the police under the Defence of the Realm Act. The Company had made the Council an allowance which he thought was inadequate. The lights were obscured, so it was questionable whether it would not be as well if they did not light the lamps at all next winter. It would be a saving of £110 to the parish. The Council agreed to obtain legal advice on the subject.

Bravery Rewarded.—At Buckingham Palace, on Monday of last week, among other decorations conferred by His Majesty the King, the Edward Medal of the Second Class was bestowed upon Mr. John G. Hinge, for bravery under the following circumstances: On Oct. 1, 1914, Mr. Hinge was engaged, with another man, at the Borstal Institution, Feltham, in removing an obstruction which had occurred in a gas-main, when an explosion occurred, hurling Mr. Hinge out of the door of the building where they were working. The other man was thrown against the opposite wall, and his escape jeopardized by the flaming gas between him and the door. Mr. Hinge pluckily went to his rescue, and succeeded in helping him out. He then, although badly burned and nearly collapsing, took steps to cut off the pressure of the gas, thereby preventing the possibility of further explosions, which might have caused very serious loss of life.

Mists on Tarred Roads.—Not a few motorists in the Thames Valley, says the "Motor," will be aware of the recurrence of patches of mist above the surfaces of tarred roads during or after rain. This is very noticeable, to quote a single instance, on the road between Windsor and Egham. The same condensation of vapour does not occur contemporaneously above stretches of road which are surfaced with gravel, or with non-tarred material. The vapour tension—*i.e.*, the tendency of water vapour to behave as a gas—is presumably less on a tarred road than on a gravel or other non-tarred one; and this point is of some importance. Motorists do not enjoy either fleeting or continuous visits to zones of mist. Driving is at times rendered difficult in them; and the dangers of locomotion are undoubtedly increased. The hope is expressed that the experts of the Road Board and of the National Physical Laboratory will include in their series of tests of road-surfacing materials such investigations as will have a due bearing on this factor.

Hull Water-Works Extensions.—When making their annual inspection of the Hull water-works last week, the Water Committee had a particularly interesting visit, in view of the extensions which are approaching completion at Holderness, and the early linking-up of Withernsea with the water-main direct from Hull. The party included the Lord Mayor (Alderman Hargreaves), Mr. P. Gaskell (the Chairman of the Water Committee), Mr. W. L. Harrison (the Deputy-Chairman), Mr. C. B. Newton (the Water Engineer), and many members and officials of the Corporation. The trunk main is now laid as far as the parish of Halsham; and it is expected that the 15-mile main to Withernsea will be completed about the end of August. Two service reservoirs are under construction at Batty's Corner, in the parish of Rimswell. They are being built of reinforced concrete; the upper reservoir holding 100,000 gallons, and the lower one 300,000 gallons. The latter will contain the Withernsea supply. The reservoirs will be supplied by automatic electrical pumping.

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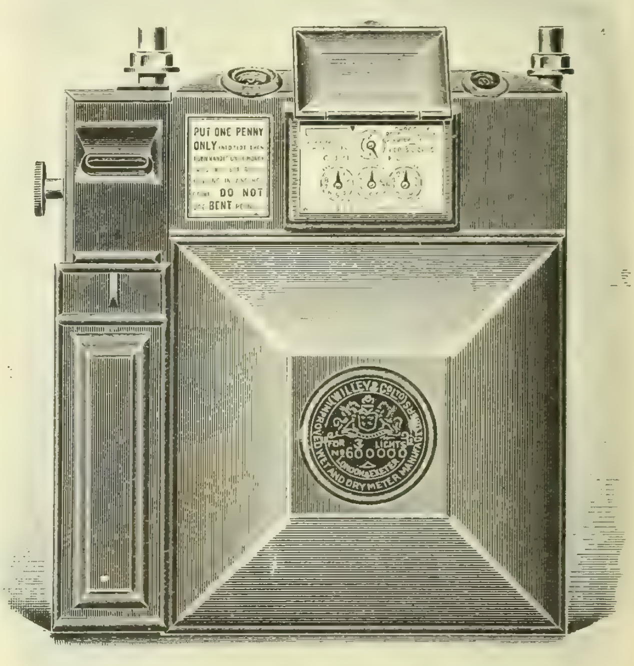

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The Pudsey Gas Company have denied the truth of a rumour that it was their intention to increase the price of gas, in view of the high cost of production under present conditions. The Company do not consider it necessary, this year at any rate, to make an alteration in price.

At a meeting of the Bradford City Council last week, it was reported that the Gas Committee had decided that, as high-pressure gas could not be supplied during the past quarter, no charge should be made for the lamps supplied by the department in connection with such supply for this period.

The Ackworth, Featherstone, Purston, and Sharlston Gas Company, supplying many villages in the South Yorkshire coalfield, have found it necessary to increase the price of gas 3d. per 1000 cubic feet, the change to date from July 1. The Normanton Gas Company, catering for a similar class of supply, have advanced the price 3d.; but the date of the change has been fixed at June 1.

The Hampton Wick Urban District Council, at a meeting last week, had before them a letter from the Gas Company, giving twelve months' notice to determine the existing agreement for public lighting, and stating that they had been compelled to take this step owing to the increase in the price of gas.

The Harrogate Gas Company have increased the price of gas 4d. per 1000 cubic feet. It is stated that this rise will represent only £4500 towards the £10,000 extra the Company will have to pay for coal. The increase is not really a hardship on the consumers, as they have had several decreases in recent times.

As they have not obtained the sanction of the Local Government Board to a loan for capital expenditure upon gas-stoves, fires, and cookers, the Finance Committee of the Leeds Corporation have decided to establish a sinking fund on a ten years' repayment basis, and on the conclusion of the war to make application to the Board for sanction to borrow the necessary money for such appliances.

GAS COMPANIES IN THE STOCK EXCHANGE.

Last week on the Stock Exchange was to a great extent a second edition of its predecessor—almost a case of War Loan *et prœterea nihil*. And thus it seemed bound to be and continue until the issue of the allotments should have opened the way to a free market in the loan, and other like securities should have found their level. Among other speculative contingencies touching the loan which were the subject of some conversation during the week was the question whether the Treasury would fix a minimum price for it; but the weightier balance of opinion seems to be that this is improbable and inadvisable. Business generally all round the markets was very quiet, reaching something like stagnation point on Thursday. But the tone on the whole was very fair, and even cheerful at times, except in quarters exposed to special debilitating factors—*e.g.*, Home Rails in face of the South Wales strike. Colonial issues, and the American, South African, and Foreign markets had their good points; but the old Loan was weak. In the Insurance Market, the event was the issue of the Government anti-aircraft and bombardment scheme. The rates of premium came in for some criticism as being too flat and insufficiently discriminating between the different classes of risk; but the private householder has nothing to complain of. Business in the Gas Market was no more abundant in the aggregate of transactions marked than the week before. As regards recorded prices, those of some issues were rather better than the previous week and some a little lower, but neither was of sufficient magnitude to create a dominating tone. In the Money Market, there was a better demand for short loans, and discount rates were firmer.

Bargains done for cash during the week were as follows: On Monday, Brighton and Hove ordinary 139, Continental Union 39, 39½, Gas Light ordinary 81, 81¼, 81½, 82, 82½, Primitiva preference 3¾, 3⅞, South Suburban debenture 95. On Tuesday, Gas Light ordinary 81, 81½, 82, ditto debenture 59¾, 60. On Wednesday, Bournemouth "B" 12 7/16, 12⅝, Cape Town 1 7/16, Commercial 4 per cent. 91¼, 91¾, Gas Light ordinary 80½, 81, 81⅜, 81½, ditto preference 70, South Metropolitan 83. On Thursday, Gas Light ordinary 80¼, 81, 81½, ditto debenture 60¼, 60½, Newcastle preference 88, Primitiva 2⅝, South Metropolitan 83½, 84, Barnet "B" 134, 135, ditto "D" 105, 105½. On Friday, Gas Light ordinary 81¼, ditto debenture 59½, 59¾, 60, South Metropolitan 82½, 83, ditto debenture 59½. On Saturday, Gas Light ordinary 81½, 81¾, ditto debenture 60¼, 60½, South Metropolitan debenture 59½, 60.

Bank rate (fixed Aug. 8), 5 per cent.; last year, 3 per cent.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING JULY 17.

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	..
874,000	"	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7½	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	..
50,000	10	Feb. 26	16	Bournemouth Gas and Water 10 p.c. . .	29—30	5 6 8	..
873,480	10	"	7	B 7 p.c. .	15—15½	4 10 4	12 7/16—12⅝
95,000	10	"	6	Pref. 6 p.c.	13½—14	4 5 9	..
—	—	—	—	Deb. . .	..	—	..
380,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
830,000	"	"	11	Do. New . . .	204—209	5 5 3	..
50,000	"	"	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
206,250	"	June 11	4	Do. 4 p.c. Deb. .	91—93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	"	"	8	Do. A Ord. Stk. .	154—159	5 0 8	139
530,000	20	Mar. 26	12½	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	1 7/16
100,000	10	—	—	Do. 4½ p.c. Pref. .	4—6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	91¼—91¾
560,000	"	"	5⅓	Do. 3½ p.c. do. .	103—105	5 1 6	..
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	..
800 000	Stk.	"	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	"	"	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	Derby Con. Stk. . . .	123—125	4 16 0	..
55,000	"	—	4	Do. Deb. Stk. .	102—104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd. . . .	17½—18	5 11 1	..
16,363,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke 4 p.c. Ord. . .	98—102	4 15 6	80¼—82½
2,600,000	"	"	3½	3½ p.c. max. .	76—79	4 8 7	..
4,062,235	"	"	4	4 p.c. Con. Pref.	96—99	4 0 10	70
4,674,850	"	June 11	3	3 p.c. Con. Deb	72½—74½	4 0 6	59½—60½
130,000	"	"	10	10 p.c. Bonds .	..	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16½—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c. . . .	..	—	..
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C . . .	151—154	5 2 4	..
65,780	"	"	6⅜†	Do. B	115—118	5 8 0	..
65,500	"	June 26	4	Do. 4 p.c. Deb. . .	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental .	150—160	5 12 6	..
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c. .	119—121	5 7 0	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. A	211—213	4 13 11	..
718,100	"	"	7	B	146—14	4 14 7	..
306,083	"	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	—
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd. . .	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con	97½—99½	4 10 6	..
529,705	Stk.	June 26	3½	Do 3½ p.c. Deb	82—83	4 4 10	
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	.
300,000	Stk.	May 14	8	Oriental, Ltd. . . .	117—122	6 11 2	
60,000	5	Mar. 26	10	Ottoman, Ltd. . .	7¼—7¾	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B . .	128—131	4 19 8	
100,000	50	"	12	Do. C . .	118—121	4 19 2	.
52,000	50	"	10	Do. D . .	..	—	..
249,980	5	April 29	8	Primitiva Ord. . .	5½—6	6 13 4	2⅝
499,960	5	June 26	5	" 5 p.c. Pref.	4¾—5	5 0 0	3¾—3⅞
521,600	100	June 2	4	" 4 p.c. Deb.	91—93	4 6 0	..
—	—	—	—	" " " 1911	..	—	..
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo 6 p.c. Pref	10½—11	5 9 1	..
125,000	50	July 1	5	5 p.c. Deb	47—49	5 2 0	.
135,000	Stk.	Mar. 12	10	Sheffield A	221—224	4 9 3	..
209,984	"	"	10	Do. B	222—224	4 9 8	..
523,500	"	"	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African . . .	10½—11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord	111—113	4 16 8	82—84
1,895,445	"	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	59½—60
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	..
60,000	"	"	5	Do. 5 p.c. Pref. .	110—112	4 9 3	..
—	—	—	—	Do. West Kent. .	..	—	..
137,058	"	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	95
629,740	Stk.	May 14	5	Southampton Ord. . .	99—102	4 18 0	
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c. .	135—138	5 8 8	
742,275	"	"	6†	B 3½ p.c.	115—117	5 2 7	..
181,255	"	June 26	4	4 p.c. Deb	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	"	"	6⅞	" B 3½ p.c.	129—134	5 2 7	
108,075	"	"	5/17/3	" C 3½ p.c	110—115	5 2 0	
352,000	"	"	6⅛	Wimbledon 5 p.c. .	117—122	5 0 5	..
98,000	"	"	6⅝	Epsom 5 p.c. . . .	121—126	5 5 2	..
88,416	"	June 26	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

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Meter Repairers. No. 6067.
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Meetings.

South Metropolitan Gas Company. De Keyser's Hotel. Aug. 11. Two o'clock.
South Suburban Gas Company. De Keyser's Hotel. Aug. 13. Three o'clock.
Tottenham Gas Company. Works. Aug. 7. Three o'clock.

TENDERS FOR

Coal.

Sheffield Gas Company. Tenders by July 22.

Oxide (Spent).

Barnsley Gas Company. Tenders by July 28.

Sulphate of Ammonia Saturator.

Bridgwater Gaslight Company.

Tar.

Northwich Gas Company. Tenders by July 24.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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EDITORIAL NOTES.

Price of Coal (Limitation) Bill.

WHEN the Price of Coal (Limitation) Bill was brought by the President of the Board of Trade before the House of Commons yesterday week for second reading, there was naturally some amount of snarling from one section of the representatives of the coalowners. But in contrast with this, the prolonged debate was distinguished by a very general sympathy, from all other quarters of the House, with the intentions of the Bill. The dissentient spokesmen for the coal interests were shrewd enough, long before the end of the discussion, to see that the great body of opinion in the House was distinctly in favour of regulation, and that they might just as well attempt to blow up the fabric of the British Constitution as try to override the solid legislative judgment that it is unsafe to allow trading in the native and fundamental commodity, coal, to be left unconditionally during the war in the hands of those who have not shown that regard for British interests which unity of purpose in the settlement of the most momentous issues that have ever faced us as a nation should have made the actuating incentive in their dealings. There are two sections of coalowners sitting in the House; and they are also representative of the opinions that exist among the coalowners outside. One section would prefer to see the Bill destroyed (or alternatively a tax imposed on war profits); the other section are among the most ardent supporters of the aims of the measure, and are even critics of it in that, in their opinion, it should be extended to coal sold to our Allies (but the question of fluctuating exchange comes in here) and to the merchants who deal with small consumers. There were cynical things bandied about from the one section to the other; and the owners had a shot at the merchants, and the merchants at the owners. Neither the opposing owners nor the merchants confessed to having been making undue profits; but the one thought the other had been doing so, and candidly said as much. By the disinterested members, salt was not applied in grains, but in pounds, to some of the statements made; and the smile incredulous was almost universal while the wordy warfare proceeded.

The lead in opposition was taken by Sir Joseph Walton, who at first sought the complete destruction of the Bill, but withdrew his amendment after hearing the statement of Mr. Runciman, and after having had a pretty clear indication from the House that he was championing a forlorn hope. One ground on which Sir Joseph, staunch defender of untrammelled liberty for the coalowners, opposed the Bill was that it applied to only one industry, and left other great industries which are netting huge war profits to go scot free. He made a special point of dragging in the gas industry as an illustration, which was a blunder, and which shows one of the penalties that the industry has to pay for its lead against the war being made an excuse for burdening the country through the chief native product. Other industries may have made considerable special profits owing to the war; but the gas industry is not one of them. The industries that have made war profits have the genial assurance of the President of the Board of Trade that the Chancellor of the Exchequer already has his eye on them, and is going to see that the country has a picking out of these profits. Sir Joseph Walton referred to gas companies as making big prices out of coke, and out of substances that the Government require for munition purposes. On the latter point, the Government knows better than Sir Joseph that the gas undertakings of the country are behaving very handsomely and very patriotically in this matter, and that comparatively little expense is falling upon the country through the application of the simple process of extraction devised by Mr. Charles Carpenter, D.Sc.; the gas undertakings only securing from the tar distillers the additional value of their tar, or at all events should do so. As to the higher price of coke, it is a good thing for the gas consumers that this has been obtained, or their position would have been very much worse than it is through the price of coal and the costs incurred in freight and delivery of coal on to the works.

War profits in the gas industry! The very idea raises a contemptuous smile for those who, like Sir Joseph Walton, take a survey from the outside, and, knowing little or nothing of the actual facts inside, draw wrong conclusions. The strongest possible comment on Sir Joseph's speech was furnished a day or two later by the announcement of the Directors of the Gas Light and Coke Company, that they propose to pay a dividend for last half year at the rate of £4 4s. per cent. per annum, less income-tax, compared with £4 17s. 4d. a year ago. It is true some gas undertakings are still receiving coal under pre-war contracts. A point was made of this; and it was alleged that this coal was being supplied by coalowners at a loss under current conditions. The argument might appeal to some who do not know the whole chain of circumstances, but not to those gas administrators who, through non-delivery under contract owing to the "scarcity" of coal for the purpose, had last winter to buy in the open market (in which curiously enough there was not the same "scarcity") and from which they could satisfy their requirements at heavy prices, which put a substantial profit in someone's pocket. There were, of course, gas undertakings that suffered from the difficulties of transport and freight rates. But all of them would much rather have had, at the proper time, the coal due to them under their contracts than have had to suffer the expense and the anxieties in which they were involved. It is also true that many are now receiving excellent supplies of coal under unexpired and new contracts, thanks not to voluntary special efforts of coalowners (of course, not speaking inclusively), but to the operations of the Coal Exports Regulation Committee, the Chairman of which, Mr. Russell Rea, stated that the principle that is guiding the Committee is the Englishman first, and the foreigner second. The coalowners will see from this that their best policy is to work so as to satisfy all the requirements of this country, under the Price Regulation Bill, and then the Exports Committee will deal more leniently with them, when proposed overseas business is not suspect in the matter of benefit of any kind for enemy countries. Mr. Rea, it will be seen from our report, gave figures which showed the increasing quantities the London Gas Companies are now getting into store as a protection against next winter. But there again the coalowners do not appear to recognize that the cost of putting coal into store, and taking it out again for gas-making purposes, is heavier than working direct from incoming coal.

There was talk, on the part of Sir Joseph Walton, about the principles of free trade. But one has only to read the Departmental Committee reports that have been issued as to the coal trade of the country to know that in it the principles of free trade are more honoured in their breach than in their observance; and to those identified with such a large coal-consuming industry as that of gas supply, the reports were not required to enable them to arrive at the same conclusion. The old point was made that the profits of the coalowners are more visionary than real; and so ardently is this point pursued and emphasized on every possible occasion, that a credulous individual might be excused for wondering why it is the coalowners have not long since found their way *via* the bankruptcy courts into the workhouses of the country, and left the business of coal getting and dealing in the hands of others who would eventually succeed to their same miserable condition. Of course, one knows about the variation in working costs between different collieries, and that some are more profitable than others. But the coal question is one that can only be dealt with as a whole. Mr. Runciman gave a basic figure for computation when he pointed out that, on the home consumption of coal, 1s. per ton increase in the selling price means £9,250,000; and this, multiplied by the shillings increase, represents a startling sum to fall as a burden upon the entire community and upon the manufactures of the country. There are people who participate in the additional profits, after deducting increased expenses. Who are they? The coalowners say they have not had the extra profits; and the coal merchants repudiate the charge of having fingered them. They have simply vanished into thin air, though the country has paid in hard cash. It is a phenomenon of the first order. But there it is.

Now the Bill proposes that 4s. per ton shall be fixed as the standard addition to the prices of 1913-14 to cover, with a margin, the additional expenses put upon the colliery owners by the war. It was surprising the coalowners did not make something more than a feeble attack upon this figure. Their difficulty was that they could not safely do so without committing themselves to unprovable assertions. Mr. Runciman figured-out generously the increased costs. The war bonus to the miners—the 15½ per cent. in the federated area, the 18¾ per cent. in Scotland, the 17½ per cent. in South Wales, and the 15 per cent. in Durham—represents an average increase of 1s. per ton throughout the country; the cost of materials (pit props, &c.) another 1s.; and the reduced output means greater establishment charges, &c., per ton of coal. The total is about 3s., leaving 1s. as a margin to cover exceptional cases. This is liberal—too much so says Sir Arthur Markham. He went further than this, and described (from his experience as a coalowner) the 3s. as nonsense, and said, if the amount were cut in two, it would be nearer the truth. Anyway, it is beyond dispute that the Bill proposes liberal treatment; and when the Committee stage was reached on Thursday a strong effort was made to reduce the 4s. to 3s. This was firmly resisted by Mr. Runciman on behalf of the Government. There is the question as to the base prices upon which the 4s. is to be placed—prices ruling during the twelve months preceding the war. It will be difficult, despite fines, to get them properly fixed; but though an endeavour was made in Committee to settle safer lines in this regard, no other course was found which was acceptable. There was a great deal of argument as to whether the pithead prices should be the basis of regulation or the prices to the consumers. This referred principally to household coal; and Mr. Runciman described the difficulties of getting away from the pithead. Sir Joseph Walton and his followers, too, would have liked to see the Bill limited to household coal; but the dependence of the community upon the manufacturing industries of the country also put this out of court.

There was one important concession made during the Committee stage, although the point affected was hardly touched upon in the debate on second reading. It was that, on an amendment, which proposed to make the measure retrospective (but which was rejected), Mr. Runciman admitted that he thought a case had been made out for giving corporations and public utility companies some relief from any heavy priced contracts entered into before the introduction of the Bill. The contracts of the Glasgow Gas and Electricity Departments were cited as examples. The President promised that the Government would consider the matter before the report stage of the Bill was reached, which looks hopeful for those gas undertakings which have paid in excess of the 4s. over 1913-14 prices. But this will not affect contracts for coal for household and other purposes.

The second reading went through without a division. The Committee stage passed with few amendments. This all speaks volumes. The Bill, and the manner in which it is being accepted, indicate that there are those in the coal trade—not all, but not a few—who have forfeited public confidence, and that it had become necessary for the Government during the remainder of the war to protect the country against further excesses.

The Gas Industry and "Essential Work."

We are somewhat doubtful whether the Government Departments concerned with the recruiting of men for the Army and Navy and for securing volunteers for munitions work are fully conscious of the part that the gas industry is taking in provisioning the Army and Navy with first essentials to their work. If they do so appreciate the position, then it might surely receive expression by a larger and definite recognition of the fact that the gas industry cannot continue its services with the same efficiency and to the same degree, if robbed of any more of its men.

Voluntarily, the industry gave up, to the last man, all those who could be spared, wished them God-speed and a victorious issue from the world-racking struggle, and made monetary provision so that the dependants of the men should not suffer any privation by their absence, and the men themselves should not be worse off by going to defend national honour and home. This was all before there was complete recognition of the fact that the country was short of munitions of war, and that the gas industry would be called upon, as part of the great national machine, to contribute light, heat, and energy to many more factories that were to be turned on to the production of additional munitions of war, and before it was known that the gas industry would attain such an important position as the provider of toluol for high explosive purposes. The gas industry is in truth busily engaged on Government work; but unfortunately for the defence of its labour in keeping things going properly, the work is of an indirect, though essential, order. This being so, the industry has failed to obtain a satisfactory undertaking as to further recruiting. Now comes the National Registration Act, as well as the call for munitions volunteers. Gas workers are just about the sort of men who are valuable for munitions work; but the factories making munitions of war want light, heat, and power. The work also requires toluol, sulphuric acid, and other derivatives from the secondary products of gas manufacture. It is therefore important that the working and productive efficiency of gas-works should not be further impaired. If this could be impressed upon certain Government Departments, the forthcoming National Register would be a great benefit to the gas industry, as an aid to discrimination on the part of the departments. The industry has been quite willing to spare all the men possible; but there is a limit to deprivation if safety is to be assured.

The matter has again been raised by Mr. Walter T. Dunn on behalf of the Institution of Gas Engineers—this time with the Munitions Enrolment Committee. In view of the depletion of the ranks by enlistment, it was asked that gas workers and gas-plant makers should be immune from enrolment as munition workers. But no such general undertaking, it was said, could be given. There are, however, rays of hope in the reply received by Mr. Dunn which is printed in a later column. One is that not all men enrolled as munition workers will be transferred from their present employment; and another is (this is highly important) that an opportunity will be given to the employer to state, for the consideration of the Minister of Munitions, whether or not a man is engaged upon Government or *other essential work*, or to submit any other reasons which, in the employer's opinion, render it desirable in the national interests that the workman should not be transferred from his existing employment. Most gas-works managers will be able to show that the men remaining with them (some of whom are not so skilled as those who have already left for military and other national service) are engaged on "essential work." So long as gas managers are given the opportunity of showing cause why they should not be deprived of the services of more men, they will not have so much cause for complaint; for, in regard to most gas-works, an excellent case can be made out to-day. It can be taken for granted now (unless a fresh pronouncement is made) that there will not be universal exemption for the gas industry, any more than for other industries. The line seems to have been definitely drawn at Government and "essential" national work; and the War Office, the Admiralty, and the Munitions Department are not disposed to limit the area from which they can make drafts by pushing the exempting line further outwards.

Gas-Works Products Now and After the War.

During the war, the primary and secondary products of coal carbonization in gas-works have made several new developments as ministers to the service of man and of the nation; and when these developments are assembled, and are viewed in the aggregate, they present something much more substantial bearing upon the future of the gas industry than if viewed individually. At the annual meeting of the European Gas Company (reported in our news columns to-day) Mr. H. E. Jones referred to this matter. He sees the gas industry acquiring quite a new position—largely through the war—in both the commercial and the political worlds; and the unquenchable optimistic temperament tells us that, through what has occurred, in every way the residual products of gas-works are going to be better known and better understood, and inure to the advantage of gas manufacturers to a greater degree than ever before. We believe this is right. Temporarily some of the gas business here and there has been lost through restrictions, enforced economy, and higher prices; but, generally speaking, no one can examine the situation without seeing that in various ways the war has been the means of creating (as Mr. Jones puts it) a "new position" for the gas industry.

There is gas. Through the war it has been brought into use in unparalleled measure for heating furnaces and other appliances in industry. In new factories and in extensions of factories in which war materials are produced, and in converted factories for the purpose, gas furnaces and other appliances have been introduced of all types and in a large range of capacity. All the new experience that has thus been gathered is not going to cease to be productive with the close of the war. The men who have had experience of the conveniences and time economies of gas heating during the war will find new applications for it in the work upon which they are engaged in normal times; and their experience is not going to be locked up in their factories, and find no outlet into other branches of industry. Then as to coke. The experience there has been with it during the war is going to advantage it afterwards. There is distinct evidence of this. The distribution and the available supplies of coal about the country are considerably better than at the time during last winter when there was a raid on gas-works for the first of the secondary products. But still gas-works have no cause to complain of the business that is now being done in coke. This is a good sign. At the same time the efforts to increase its demand for steam-raising, for hot-water supply in bulk, and for other domestic and industrial uses must not cease. In the largeness of demand is safety for the future; and no gas man wishes to again see those gloomy-looking coke-heaps that had increasing bulk week after week preceding the war. Sulphate of ammonia, too, owing to the war, is a good line, through the restriction of supply, owing to the doors of Germany being under our guardianship. But sulphate of ammonia will be a danger spot after the war. Sentiment, or hatred of the inhuman war methods of Germany, is not likely to alone affect overseas sales of sulphate of ammonia; that sentiment and hatred must be supplemented by well establishing ourselves now in the matter of good quality, as advised in the article in last week's issue, p. 124. There are makers who refuse to be persuaded of this. They must take the consequences, though in the *post*-war interests of the whole of the makers their conversion is a *desideratum*.

Last, but by no means least, there is what Mr. Jones calls the "romance" of tar. Tar has had a career which fully justifies the application of the term. At one time of day, gas-works were talking of burning the product for steam-raising and retort-heating, owing to the price realized being no better than, if as good as, its fuel value. Then came the vast requirements (which are not so vast at the moment owing to the withdrawal of the Road Board's financial contributions during the war) for road surfacing and making purposes; and the position of tar improved, and a better revenue was derived from it. Then the war, and the coming of the demand for the necessary tar products for making the extreme opposites of dye-stuffs for the peaceful purpose of beautifying and of high explosives for destructive uses. The sequel of treating, at normal temperature, gas by tar was told in the article in last week's issue on "The "Market Value of Light Oils and Other Constituents of "Tar." The pecuniary advantage of the system was shown by comparing the quantities of, and the revenue from, the derivatives of 100 gallons of crude tar, and 100 gallons of tar which had been enriched by contact with gas. Under the conditions explained in that article, a substantial addition to the tar value was shown by the process; and such an addition that the treatment may possibly be introduced as a permanent one if the outstanding question for definite settlement—the effect on the composition, and on the utility to consumers, of the gas itself—comes out on the right side. Then there is the trouble regarding pitch. This might be profitably disposed of to a greater extent than it is by—utilizing with it coal and coke dust—producing a briquette fuel which would have a ready sale in these days of high priced coal. Further, sulphur is in good demand owing to the price and market conditions of sulphuric acid. In all ways, the outlook for both the primary and secondary products of gas-works in the *post*-war days is promising, if only proper advantage is taken of current opportunities, and our new gains, to use a military phrase, are thoroughly "consolidated" so that they may continue to be held. The residual products of gas-works are not only "going" to be better known and better understood, they are now better known and better understood than when the war started, and are becoming increasingly so day by day. This is all to the advantage of gas manufacturers; and Mr. Jones's optimism in this connection is fully justified by the march of events.

Incandescent Lighting and Calorific Value.

A WELL-MEANT contribution has been made by Mr. Robert Ffrench Pierce to the "American Gaslight Journal" on the subject of the composition of gas in relation to the performance of the bunsen burner. The main idea of the author, it appears to us, is to offer proof, from experiments conducted by himself with an incandescent burner and gas of varying qualities, that a high calorific power gas is unnecessary, and, in fact, is undesirable, for incandescent gas lighting, and that a reasonably lower calorific power will give the consumer better lighting value, other conditions in regard to the gas being favourable. That is now an accepted truth. But Mr. Pierce is not satisfied with occupying this ground. He goes further, and makes some sweeping assertions to which it is impossible to subscribe. There is no need to be hypercritical over phrases, such as those in the article referring to flame temperature, as though, in their nakedness, they are not so perfect in lucidity as they might be, what Mr. Pierce is generally aiming at is quite apparent to any student of the subject, notwithstanding that he goes astray somewhat in asserting the beneficial effects of high flame temperature in all processes.

The conclusions that Mr. Pierce draws from his investigations are really the important matters, as it would not aid in our industrial progress if all his deductions were commonly held. They are, in short, so sweeping that there does not appear to be, in his mind, any safe standard of quality for gas, or any standard that has intrinsic value. We cannot agree. There must be a standard of some sort; and the calorific power one is the best obtainable for adjudging gas value for all purposes, without entering into complications of an (for a standard) undesirable order. In fine, calorific value is the premier requirement. But calorific value standing alone is not, and no one would say it is who knows what he is talking about, an absolute measure of value. Composition is highly important in conjunction with calorific power to effective work. "For the present," says the author, "we "can say that gas candle power, specific gravity, or calorific "value are not of the slightest value either in predetermining "the value of a lamp or in fixing standards of service for "gas lighting." Again, "for at least 50 per cent. of the available gas business in the United States, the calorific value "standard would be as useless, meaningless, absurd, and ridiculous as the present candle-power standard." This is going too far. There is no function in which gas is employed in which calorific value has not some concern. If in conjunction with calorific power testing, a specific gravity record is taken, this will supply some indication as to the carbon dioxide and nitrogen content of the gas—whether or not these are increasing or decreasing. With increase, too, in calorific power, there should be an increase in specific gravity. In view of the effect that carbon dioxide and nitrogen have upon flame temperature, seeing too that the greater quantity of air required for producing perfect combustion of the high qualities of gas means the introduction of a larger volume of nitrogen, which runs off with heat units, and thus depreciates flame temperature, we cannot agree with Mr. Pierce in his sweeping assertions in regard to calorific value and specific gravity tests in relation to incandescent gas lighting. They have considerable value, and are a guide to the production of suitable gas which will supply the consumer with the commodity that, with attention to the regulation of his incandescent burners, will give him high flame temperature.

There are other conclusions in the paper bearing upon cost in relation to calorific power with which there must be disagreement. It cannot be admitted, for instance, that the cost per candle-power-hour of producing light in the incandescent burner is independent of the calorific value of the gas. It is not. And it is a curious argument that "so far "as incandescent lighting is concerned, it does not make the "least difference to the customer whether he pays $1 per "1000 cubic feet for gas of 480 B.Th.U. or $1 per 1000 "cubic feet for gas of 660 B.Th.U." It does. But the aim of the gas industry on this side has been to arrive at a calorific value that will be generally useful for all purposes, and to give as many B.Th.U. for a penny as possible. It is found that this can be done with what is termed a low grade gas; and such gas as Mr. Pierce agrees is best for the consumer, although he does not explicitly explain the reason, but only shows the effect by the results of his tests. Given equal manufacturing and business conditions, a gas of 480 B.Th.U. ought to be sold per 1000 cubic feet at a lower price than the less serviceable 660 B.Th.U. gas—less serviceable because the mechancial work associated with the combustion, by means of a bunsen burner, of the higher grade gas produces a depreciated result in proportion to the B.Th.U. expended.

A German Belief, and the Truth.

The German and the Dutch Gas Associations have held their annual meetings, with curtailment of the customary programme. Interesting summaries of the proceedings appear in other columns. The President of the German Association seems to have been somewhat at sea as to the origin and purpose of the present war. He thinks it was born of "envy and jealousy" on the part of the enemies of Germany; those enemies have very good grounds for believing that the origin of the war is to be found in the ambition of Germany for supremacy in the world, and that this supremacy was to be gained by force of Prussian militarism, supported by the preparations of several years for this express object. In short, Germany adopted the doctrine of might over right; and, in trying to secure ascendancy, it also adopted the most barbarous and cowardly methods of warfare—including the bombarding of undefended towns, the killing of civilians (including women and children), air raids over similar towns with like consequences, the sinking by submarines of unarmed vessels, and the drowning of hundreds of civilians—men, women, and children—of all nationalities. Hideous cowardice and cold-blooded murder have been introduced as methods of warfare by the nation who, in the words of the President of the German Association, say that "the purpose of their enemies" is to destroy "German culture." If those things which we have mentioned be of "German culture," then the sooner that part of the "culture" is destroyed the better. When humane Germans are again able to look with full eye into the outer world, and learn the whole truth of certain of the doings of the German authorities and their instruments, we should imagine that they will turn with loathing from those who have been responsible not only for the war, but for acts of the most diabolical and revolting kind.

Prisoners of War in Gas-Works.

In Germany, prisoners of war are not kept without employment; and if reports be true that reach this country, British prisoners of war are awarded, because this country is the most hated, the worst jobs that are going. German "culture" ought to be accompanied by justice. There are prisoners of war employed in German gas-works; but these appear to be Russian or French. From what we know of German gas engineers, they are not the men to engage in any form of savagery against men unfortunate enough to be prisoners of war—such savagery as has been reported in certain instances. The emoluments of these poor fellows are extraordinarily lean. After all deductions are made, one gas manager admits that the balance of wages, in the case of the prisoners at his works, only amounts to 7½d. per week. It is found that the prisoners of war are responsive, in the way of an increase in work, to small additions to their wages. It transpired, at the meeting of the Dutch Association, that the Council have entered into an arrangement with the French Society to act as intermediaries between French gas workers who are war prisoners in Germany and their relatives in France. We have made use of German interned vessels for the transport of coal to gas-works; but we have not sought German prisoners of war to assist in the work of carbonizing the coal.

Coal Exports and Germany.

The regulation of our exports of coal has had a considerable effect upon the coal situation in neutral countries; and now for their own protection those countries have to look to the conservation of the supplies of which they can obtain possession, as well as (at any rate, in Holland this is being done) make systematic provision for hoarding-up reserves for possible worse times. These countries cannot now spare Germany any of the fuel landed on their shores. There is no room for the slightest doubt that a considerable amount of coal that left this country prior to the appointment of the Exports Regulation Committee was destined for Germany, *viâ* neutral countries; and coalowners and shippers must have been well aware of the fact, for there was then no other reason why there should have been the bound upwards in exports to near Continental neutral countries in close touch with Germany in the early part of the year. There has been dead-silence on the part of the coalowners and the coal papers regarding the article on this subject which appeared in our columns on the 6th inst. It is a matter that they prefer to leave severely alone. This does not apply only to the more northern coal-fields. The "Coal Merchant and Shipper" the other week showed that substantial additional quantities of coal were shipped from the Nottingham and Derby coal-field in the early months of this year, compared with the corresponding period of last year. The case expands for a thorough investigation of this matter, with the view of ascertaining whether there has been any known direct or indirect trading in coal with the enemy as well as (as a recent Scotch case proved there has been) in iron ore.

The German Government Method.

Since the tighter hold over coal exports in this country—probably as a consequence of it—a change of a very significant character has come over the coal situation in Germany. The German Government do things differently from our own Government. If they make up their minds to do a thing concerning a domestic matter they do it, and without a great wordy warfare and dealing with a mass of formal preliminaries. Not many days ago, great surprise was created in Germany by an official announcement that the Government had decided to assume control of the whole coal industry; and simultaneously publication was made of a cut-and-dried scheme. This stated that the owners were forthwith to be brought together by compulsion in associations which are to control the entire coal production and sale of coal; and no consent of the coalowners was to be sought. The German Government hold that economic upheavals through fluctuating coal prices must be prevented by all possible means during the war and for years after. Our Government have now been brought to the same way of thinking; but they have taken a more circuitous course in dealing with the matter.

The South Wales Settlement.

There were two events last week in connection with the coal industry which were of national importance. The one was that a settlement was arrived at over the wages agreement between the South Wales coalowners and miners, which sent the latter back to their duty after quite a working week's absence, and the other was the second reading in the House of Commons of the Limitation of Coal Prices Bill, which is dealt with in earlier columns. We will not enter into the questions that led to the lamentable stoppage of work in the South Wales coal-field; but the events from beginning to end constitute a piece of mischievous business over which both masters and men ought to be thoroughly ashamed of themselves for having shared in it while the nation are engaged in the most perilous and far-reaching war in the history of the world. Blame attached to both sides; and the settlement only shows what could have been done earlier, without any interruption of work, had the owners been so minded. The new wages agreement is to last during the continuance of the war and for six months after; and this is practically the only point which the men failed on, seeing that they wanted a three years' agreement. But in all other respects, the agreement is almost identical in terms with that recently made in the English federated mining area. The new standard wage and the minimum are exactly similar; the important difference being the inclusion of all surface workers in the agreement. When these points are considered, while no language would be too strong for use in condemnation of the action of the men in leaving work under the circumstances, the owners deserve equal censure for putting the country in such jeopardy by not sooner agreeing to the terms to which there had to be ultimate submission, and which terms so closely harmonize with those already existing in the federated area.

A Central Radiant Heat Distributor.

There is no question that, if considered only from the point of view of room heating, and not from that of general convenience, the conventional location of the fire in a room is altogether wrong. It is wrong to have it at one end of a room, and expect it from that situation to equally raise the temperature in all quarters of the room. In that situation, with its back to the wall, it can only have one radiant face. But the situation has been primarily fixed by the necessity of having a chimney running up the side or the party wall. Of course, it would not be convenient to have a central fire in small rooms; but a central fire in a room, with a radiant face all round—the degree of radiancy being regulatable at will—would be, where room convenience and use permit, the ideal means of heating. The radiations would be brought into more equable relationship with all the walls and articles in the room, and so heating would be more uniform. On cold winter evenings, there would be no necessity to pack the family round a single faced fire at one side of the room. There would be freedom to sit where one pleased, and feel the cheerful rays from the centrally placed fire. But there are large interiors—halls, hotel and club rooms, hospital wards, workrooms, libraries and reading-rooms, school-rooms, waiting-rooms, and many other places—where such a fire could be appropriately arranged. We have been wondering a long time whether a radiant fire for central heating would ever be produced in which gas would be the fuel; and there was therefore pleasure in noticing last week (p. 127) the gas-fire Messrs. R. J. Rogers and W. E. Cadwallader have invented, and which gives a circular grouping of radiants, and so a circular radiating surface. This fire is as complete a departure from the ordinary gas-fire as one could desire; and the proportion of metal work to radiating surface is by it considerably reduced compared with ordinary patterns. There ought to be a big demand for the new fires. We can see the Home Office inspectors of factories and workshops taking such a fancy to them as to recommend them in place of flueless radiators. These new central fires require a flue; and a japanned iron one, or a galvanized iron one painted outside, is recommended. We do not see why ingenuity should not provide something more presentable, so that the circular fire could be used in places superior to those in which an ascending painted metal flue is permissible. We like the idea of this fire; and there ought to be an early embarrassing demand upon the makers for it.

Gas Light and Coke Company's Dividend.

The Secretary of the Gas Light and Coke Company (Mr. Henry Rayner) states that the accounts of the Company for the past half year show that (subject to audit) the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the rate of £4 4s. per cent. per annum, carrying forward to the next account the sum of £436,058.

South Metropolitan Gas Company.

Mr. F. M'Leod, the Secretary of the South Metropolitan Gas Company, writes to say that the accounts for the half year ended June 30 last show that (subject to audit) the balance to the credit of the net revenue account will enable the Directors to recommend payment of the statutory dividend at the rate of £4 8s. per cent. per annum, and carry forward to the next account the sum of £4791.

The Otto Coking Company, of New York, have secured a contract for erecting benzol apparatus in connection with the bye-product coke-works of the Citizens Gas Company of Indianapolis. It is specified that the benzol addition shall be in operation in ninety days.

Gas Supply in Long Island.—Large extensions of the gas and electric systems of Long Island have been approved by the Public Service Commission of the State of New York. The Nassau and Suffolk Lighting Company have been authorized to spend an additional half-million dollars and more on extensions and improvement of their gas plant, in various districts. The proposals of the Company are to build a new generator-house, machinery-house, governor-house, meter-house, and laboratory. They will also provide a street-lamp service for 1000 lamps, a new main (2000 feet long) across Great South Bay, an artesian well, and numerous new machines and engines for the manufacture of water gas. In addition to all this, the Company are laying 400,000 feet of 4-inch and 220,000 feet of 2-inch main. The Public Service Corporation of Long Island have been authorized to expend the necessary capital on the provision of 300,000 feet of 4-inch and 200,000 feet of 2-inch mains, 1000 new service-pipes, and 500 new street-lamp services, in different areas.

ENLISTMENT OF GAS-WORKS EMPLOYEES.

We learn from Mr. Walter T. Dunn that a letter has been received by the Institution of Gas Engineers from the Director of Recruiting with reference to the enlistment of gas-works employees for service in His Majesty's Military Forces, stating that the instructions to recruiting officers in the letter on the subject from the War Office to the Institution still hold good—viz.:

> "That on no account should skilled employees of gas-works . . . be accepted for enlistment unless they are in possession of a certificate from their employers that their services can be spared."

The letter further states that these instructions were issued to all recruiting officers, and requests that any case in which men are enlisted without their employers' consent and the recruiting officer states he has received no instructions on the subject, should be brought to notice.

GAS WORKERS AND MUNITION VOLUNTEERS.

The Vital Importance of Relief.

The following correspondence has taken place between Mr. Walter T. Dunn, writing as Secretary of the Institution of Gas Engineers, and the Munition Workers' Enrolment Department. In a letter, dated the 7th inst., which he addressed to the Minister of Munitions (the Rt. Hon. D. Lloyd George), Mr. Dunn said:

> The attention of the Institution of Gas Engineers has been called by gas undertakings throughout the country to the urgent necessity of such instructions being immediately given so that men who are engaged in the service of gas undertakings shall not be accepted as munition workers. So many gas-works employees of all grades have already enlisted in His Majesty's forces that no more can possibly be spared, if the public service of providing heat, light, and power, with which the gas undertakings of the country are entrusted by Parliament, is to be maintained.
>
> As you are aware, the extraction of toluol for the manufacture of high explosives is being carried on at the gas-works throughout the country, the plant of which must be kept going. It is also of the highest importance that manufacturers supplying the plant required for this work shall not be hampered, owing to their men leaving to become munition workers.
>
> We would therefore respectfully ask you to give instructions for the non-acceptance of—
>
> I. Men who are employed by gas undertakings.
> II. Men who are employed by gas-plant manufacturers in the production of plant required by gas undertakings.
>
> We shall be glad to learn that you have been able to afford the relief, which is of vital importance to the interests of the country.

To this letter, the following reply was, on the 14th inst., sent to Mr. Dunn by Mr. C. F. Ray, writing from the Munition Workers' Enrolment Department of the Ministry of Munitions of War, Whitehall Gardens, S.W.:

> With reference to your letter of the 7th inst., respecting the enrolment of the employees of gas undertakings and gas-plant manufacturers as War Munition Volunteers, I am directed by the Minister of Munitions to inform you that he regrets that it is not possible to issue instructions that men employed in particular undertakings or works should not be enrolled as War Munition Volunteers, if they state that they are not engaged on Government work.
>
> It does not, of course, necessarily follow that all the men who enrol as Munition Volunteers will be transferred from their present employment. Moreover, in every case an opportunity will be given to the employer to state, for the consideration of the Minister of Munitions, that the man is engaged upon Government or other essential work, or to submit any other reasons which, in the employer's opinion, render it desirable in the national interest that the workman should not be transferred from his present employment.

PERSONAL.

On Monday of last week, at their first meeting in the new session, the Council of the Society of Arts elected Mr. Dugald Clerk, D.Sc., F.R.S., as Chairman for the ensuing year.

Mr. W. J. Collins Garrard—the youngest son of Mr. J. S. Garrard, the Secretary of the Eastbourne Gas Company, and who is second assistant upon the engineering staff of the Ipswich Gas Company—has just been gazetted Second Lieutenant in the 12th Worcestershire Regiment.

Mr. Charles E. Ellis, who has been Managing-Director of Messrs. John Brown and Co., Limited, for the past 25 years, has resigned his directorship of this and two other companies, in order to place his services at the disposal of the Ministry of Munitions. In addition to his many other appointments, Mr. Ellis has for many years been Hon. Treasurer of the Institution of Naval Architects.

Mr. J. G. Tooms, formerly of Waterford, who recently terminated his engagement as Assistant General Manager and Engineer to the Primitiva Gas Company of Buenos Ayres, has been appointed by the Corporation of Christiania (Norway) Engineer for the construction of their new gas-works of 5 million cubic feet per day capacity, applications for which position were recently invited in the advertisement columns of the "JOURNAL." Mr. Tooms leaves England on the 10th prox.

Mr. FRANK HIGGINSON, who has severed his connection with the Broadstairs Gas Company, after having occupied the position of Secretary and Manager for fifteen years, has been presented by the officials and workmen with a gold wristlet-watch, accompanied by an address. Since Mr. Higginson took up his position with the Company (in March, 1900) many important additions and alterations have been made to the works.

Mr. W. J. LIBERTY, the Inspector of Public Lighting for the City of London—who, at the beginning of the war joined the London Anti-Aircraft Corps, and was afterwards sent to the East Coast on special service with the Armoured Car Section, and subsequently transferred to the Southern Mobile Command at Headquarters, as Acting Chief Petty Officer—has just been transferred to the Royal Naval Air Service (Foreign Service Section) at Headquarters Naval Camp, Whitehill, Bletchingly, with rank as Chief Petty Officer.

OBITUARY.

Mr. HENRY FOURNESS, the inventor of the Fourness gas-lamp, died yesterday (Monday) week at his residence, Rumford Street, Manchester, in his seventieth year. He was formerly well known in the gas engineering profession, and secured highest awards at several important exhibitions. Like many inventors, he had his share of litigation and financial difficulties; and although he had to face bankruptcy proceedings, he ultimately paid his creditors 20s. in the pound, *plus* 4 per cent. interest, as the records of the Manchester and Leeds Courts show.

The death is announced as having taken place on Saturday, at his residence, Wallington, Surrey, of Mr. A. W. COOPER, who for thirty years was Secretary of the Malta and Mediterranean Gas Company, and for the last few years occupied a similar position with the Ottoman Gas Company. Mr. Cooper's resignation of the latter position was announced at the meeting of the Company reported in the "JOURNAL" last August; while at the meeting of the Malta and Mediterranean Gas Company reported in our pages earlier this month intimation was made that a new Secretary had been appointed.

The "American Gaslight Journal" of the 12th inst. announces the death of Mrs. A. M. Callender, on July 6, at her home in New York City. Mrs. Callender became the Senior member of the firm of Callender and Co., the Publishers of the American "Journal," upon the death of her husband in 1871; and since 1913, when the business was incorporated, she has acted as its Vice-President and Treasurer. For more than forty years Mrs. Callender had been in touch with gas matters, and was personally well known to all the older generation of gas men. She leaves one son, Mr. Elbert P. Callender, the President of the Company owning the "American Gaslight Journal."

The Unsightliness of Gasholders.

In their column of lightly worded notes—"From an Office Window"—on Tuesday last week the "Daily Chronicle" wrote: One may be sure many architects are out of work just now, when the world seems intent upon battering rather than building. Let me give them a problem to solve in the peaceful future. For an hour or two yesterday I was driving with an artist from abroad through one of the loveliest parts of Surrey. Suddenly he gave a gasp, "How hideous!" It had fairly "caught him in the eye" as he was enjoying the hills, lanes, colours, and wide sweeps of outlook. It was a gasometer. Is there anything more hideous than this erection—of invariable shape? There must be some architect of genius who could reform the gasometer—that constant blot upon the landscape. We have got beyond the state of mind of Ruskin, which led him to protest against the beautifying of such abominable things as railway stations (although he consented to use the railway to Coniston). We do not want to abolish gas. But let us implore our architects to reconstruct, or at least mask, those huge inverted saucepans which despoil the banquet of the eye. Several correspondents have called attention to the above, one of whom remarks: I think everybody agrees that gasholders are not exactly things of beauty, although I have for some few years past had an affection for them, because I know they indicate the locality of the people we have to deal with in our business. Abroad, as you know, they are sometimes "housed," in order to hide any disfigurement. The following is taken from last Sunday's "Observer:" The "Daily Chronicle" is rashly inquiring for "some architect of genuis who could reform the gasometer—that constant blot upon the landscape." It is a deplorable quest; and we realize one of the advantages of the war in the fact that it will force us to economize in the decoration of things better left undecorated. We no more want a decorative gasometer than we want a decorative pickaxe; the most artistic gasometer, like the most artistic pickaxe, is the one which does its work best, and is adapted to that end and to no other. Who does not find the average gasometer a more beautiful edifice than the average cinema "palace"?

ELECTRICITY SUPPLY MEMORANDA.

A Quick Reverse for Southampton.

IN the "Memoranda" for July 6, a paragraph appeared, with the side-heading "Changed Opinions." It dealt with the refusal of the Board of Trade and a House of Commons Committee to insert, at the instance of the local Gas Company, the Northumberland clause in the Southampton Corporation Electricity Order, and with the changed opinions, since the Winchester clause was inserted in an Order referring to that ancient city, of Sir John Snell, the President of the Institution of Electrical Engineers, who now confesses, by the act of present opposition, to not having then considered in all its bearings the effect of the insertion of the clause. Of course, he has not considered them all now, if his revised opinions allude to any and every electricity supply undertaking, because he could not possibly, holding the new opinions, have contemplated the rights to protection of ratepayers as opposed to the supply of electricity to consumers at prices that do not prevent deficits falling upon an innocent body of people. It is more essential than ever—now that Prussian ambitions have brought British citizens and townsmen to the necessity of dipping deeper into their pockets for everything requisite to existence, and for financing the country through taxes and otherwise—that ratepayers generally should be assured of freedom from the compulsory burden of having to contribute to the cost of supplying other people's premises with electric light and power. There was never a more audacious or scandalous system invented than this one of piling on to the ratepayers losses in connection with municipal adventure of this kind. Ratepayers must be protected. Since 1904 Parliament and the Board of Trade have agreed with this; and on every occasion, save this one of Southampton, the clause has been inserted on the application of gas companies as large ratepayers. But while refused by the Board of Trade and the Commons Committee, it has now been inserted in the Southampton Order by the Lords Committee in respect not of the whole borough, but of the extended electricity supply area. The Gas Company would have preferred the whole area, but they must now perforce be content with the application to the extension. There was some curiosity on the part of their Lordships as to why the Board of Trade had made an exception in this case; and in satisfying their curiosity by summoning before them a representative of the Board, they have also gratified our own. The Board, it seems, reserve to themselves the right not to insert the clause if they think there is no necessity for it. Seeing that they do not think it necessary in such a substantial and long-established concern as that of Southampton, and that this was the first time the reservation had been exercised on the raising of the matter, it shows that they have had their doubts in a good many other instances. Even in the case of substantial concerns like that of Southampton, the time may come when there will be mismanagement—in fact, Sir John Snell has already told the Corporation that they ought to alter their flat-rate of ½d. per unit for cooking and heating to the rateable value system, and that they should have put a coal clause in a low-priced long-running power contract into which they have entered. Should there be maladministration at any time, combined with unpropitious circumstances, the presence of the Northumberland clause in the Order would have been very useful; and so long as the concern was properly conducted, the clause would have been quite harmless and inoperative. However, it is some gain to have had the reversal of the decision of the Board of Trade and the House of Commons Committee in respect of the extended area.

Burden-Bearing and Justice.

The "Electrician" has also been discussing the question of the application of the Northumberland clause to electricity supply undertakings. It says that the general view must be that this "should be" quite unnecessary. That, of course, is the general view. But unfortunately what "should be" quite unnecessary has been found to be very necessary indeed in many cases through municipal mismanagement, cut prices, heavy deficiencies, and considerable burdens on the ratepayers. It goes on to remark that "if profit does not arise in the ordinary course of things, it is not likely to be provided by any such clause." It cannot be denied by our contemporary that the management of not a few local authority electric undertakings has not been according to the "ordinary course of things" as the "ordinary course of things" is construed by those conducting private enterprise without the ratepayers to fall back upon to make good the results of any financial or managerial delinquencies. Our contemporary talks about "burdening" an electricity undertaking with the Northumberland clause; but it has nothing at all to say as to the more serious aspect of the matter, the burdening of ratepayers with deficiencies, sometimes for years—in certain cases the trouble appears to be permanently established. "Power agreements," it is pointed out, "are frequently made for five, seven, or even ten years;" and the question is asked, "How can undertakers burdened with the Northumberland clause entertain agreements of this sort?" The answer is, in the same way that private enterprises enter into like agreements, and make their business yield a good return on the capital, without the power to have recourse to the rates. If the "Electrical Review" were conducted by the London County

Council, and the Council cut their prices for advertisements, and did not make the "municipal enterprise" pay, having as a result to draw upon the ratepayers to make up the losses, the "Electrician," whose advertisement columns might suffer in consequence of the cutting acts of the Council (besides having to pay its share as a ratepayer for the support of the "Review"), would resent the whole proceeding and imposition. Gas undertakings are in the illustration represented by the "Electrician." They are not only business competitors of municipally controlled electricity undertakings, but they are very large ratepayers, and have been for years before municipal electricity supply came on to the scene. *Fiat justitia, ruat cœlum.*

Serious Fire Risks.

We should have thought that the danger of placing incombustible material in proximity to electric-lamps had had sufficient demonstration among shopkeepers to have prevented the imbecile practice of putting paper shades round, and in contact with, such lamps. Some people will never give up dangerous practices till they have to personally pay the penalty of their indifference. However, a warning by the London Fire Brigade may have some useful effect in certain quarters, if not generally; and we are pleased to assist in giving publicity to their views in order to produce "result in the discontinuance of the dangerous practice of using inflammable materials for obscuring lights in shop windows." The report of the Fire Brigade states that they have recently been called to an outbreak of fire caused by the crinkled paper round electric-lamp globes in a shop window catching fire, as a result of the heat generated by the lamps, and setting fire to the goods displayed in the window. The paper, it seems, had been placed round the globes, so as to obscure the lights in accordance with the police regulations now in force; and (says the report) there is reason to believe that crinkled paper, or other highly combustible material is being used in many cases for this purpose, and that "serious fire risks are thus being caused." Coloured globes and incombustible shades are advised as preferable. Speaking of fire risks, we saw the other day (after the event) a nasty case of an electric fused wire in the basement of one of the Aërated Bread Company's depôts. The wood covering had been removed, and the ugly condition of the wires at the place where the fusing occurred was fully exposed. It was a good object-lesson for the customers.

Supply to Picture Palaces.

An interesting case has been heard in the Alloa Sheriff's Court, in which the Alloa Theatre Company, Limited, was arraigned by the Burgh Authorities for the payment of an account for the supply of electricity during the month of March. The Theatre Company use a motor generator; and they contended that the energy supplied to the motor should be charged up to them at power rates. The Burgh Authorities submitted that the energy was supplied for lighting purposes, and that the generator set was merely the equivalent of a transformer. We are not very much concerned whether the electricity supplied to motor-generator sets is regarded as a power or a lighting supply —save that, if it is charged up at the lighting rates, the better the opportunity for the gas industry to come in with its gas-engines. However, it follows that, if the electricity supplied to a motor generator set is a lighting supply (which was *not* the view of the Sheriff), then, as a gas-engine could be connected up equally well with the dynamo, the electricians have, in order to be logical, to contend that the gas supplied to the engine connected to the dynamo is also for lighting purposes, though converted to electricity, and so should be charged for at lighting rates. They are queer sticks these electricians; and they enter into niceties which in the gas industry are put aside. We are not at all particular, and do not make any discrimination in fixing the charge, as to the use to which a gas-engine is going to be put. Gas supplied to a gas-engine is charged at power rates—the only difference made being in respect of the volume of the business done. This seems to be the practical and common-sense course. The Sheriff, as pointed out, could not put his mind into such a disordered state that he could see that the energy supplied to the motor, which was there expended in work, should be charged at lighting rates any more than energy supplied in any other form—as gas, or (if possible) steam. The same thing applies to electric-motors used for compressing gas. The electricians say that this is electricity supplied for lighting purposes; while the electricity is entirely expended in doing the work of compressing the gas [see "JOURNAL," July 8, 1913, p. 116]. They are comical fellows these. Although the Alloa Sheriff held that the motor must be supplied at power rates, the Theatre Company might do well to consider the economies of the gas-engine. The use of the motor genetrator set, if energy is drawn from the town cables, is necessitated by the fact that the standard pressure required in the operating boxes of picture theatres is only some 70 volts; but then the output of the dynamo is only about 68 per cent. of the energy taken by the motor—there being a loss of some 30 per cent. The gas-engine can give an economical electricity supply, and make every picture palace self-contained and independent of the vagaries of the town electricity service. The Alloa Picture Palace people should study Mr. H. C. Widlake's article, on "What Gas can do for Cinema Theatres," which appeared in our issue for Aug. 4 last year (p. 283). If the advice there tendered be taken, there will be no more trouble with the Alloa Electricity Department.

New Heating Elements.

A great deal of difficulty is experienced with heating elements of fires and ovens. Now that high temperature incandescent elements are being used in order to give users a nearer approach to what they require—that is to say, heat—trouble from oxidation and other things is experienced. The electrical people find drawbacks in connection with heating at every new step they take; and this circumstance is not very encouraging. Now the General Electric Company of America have put forward a fresh proposition for constructing heating elements; but in drawing attention to it, the "Electrician" does not appear to be highly enamoured of it. The wire serves as a core, which is sheathed by steel, copper, or other metal or alloy; and the operating temperature of the core may be from 800° to 1000° C. Hot-plates are made by pouring molten cast-iron directly around a coil of the sheathed wire. This, it is stated, gives a strong rugged hot-plate, which will not warp or crack. The criticisms of the "Electrician" are that it is clear the steel sheath must be at a temperature very much lower than that of the wire, and that, if unprotected steel were at a radiant temperature, oxidation would set in. For this reason, the surface must be protected by a coating of aluminium steel alloy, if the temperature is to be above 400° C. Again the new style of wire must be more bulky. Our contemporary is of opinion that what is required still more is an alloy which will not oxidize when running at a bright red heat. From this it is seen that the electrical industry is not yet out of the wood in the matter of the provision of heating elements which are, mechanically and in heating efficiency, the superiors of their predecessors. It seems to us that to realize greater durability in electric heating elements something has to be given up in the way of efficiency, which means increased cost.

Osram Lamp Control.

When the war started, everything German was as a red rag to an incensed British public. The foul and inhuman crimes of Germany since then have added to the abhorrence which was first felt over the terrible destruction in Belgium. The German nation will have all their work cut out to live-down the evil and barbarous reputation that they have been building-up with cold-blooded indifference. The Directors of the General Electric Company have seen this. They had heaped upon them heavy anxiety at the outbreak of hostilities, owing to the fact that a very large proportion of the capital in the Osram Lamp Works, Limited, at Hammersmith, was German held, and a large proportion of the profits made from the British use of the Osram lamps was shipped, prior to the war, to the country of our arch enemies. At the annual meeting of the General Electric Company, the Chairman (Mr. H. Hirst) was able to announce, with gratification, that a way had been found—with the knowledge of the Treasury and the Public Trustee—which would give the future control of these works, he trusted for ever, into British hands. It would have been better if Mr. Hirst had expanded a little on this. Does he mean that the German capital will now be completely eliminated from the business, or only the control? Some doubt as to the completeness of the elimination of German control seems to permeate the words "he trusted for ever." What about the German monopoly of the use of the Travancore monazite sands? Can Mr. Hirst say whether the sands drawn from India will, after the war, be wholly assigned to Berlin, or whether they will henceforth be boycotted, and the sands brought here to provide thorium for making mantles at home?

Where Gas Cannot Beat Electricity in Cost.

It is hopeless for gas to try to beat electricity for street lighting in Consett. The Cleveland and Durham Electric Supply Company have been engaged with the Consett District Council in negotiations for electricity supply in the urban area; and one condition is that the electric lighting of the streets is not to cost the ratepayers a penny piece the next fifteen years. The cost is stated to have hitherto been about £800 a year.

The Late Mr. Allen.

At a meeting last Wednesday of the Council of the University of Leeds—the Pro-Chancellor (Mr. A. G. Lupton) presiding—the news of the death of Mr. Allen, who had served as a member of the Advisory Committee on the Coal Gas and Fuel Industries (Livesey Professorship) Department, in the capacity of a representative of the Institution of Gas Engineers, was received with regret. The Council recorded their grateful recollection of the strong interest which Mr. Allen took in the welfare of the Coal Gas and Fuel Industries Department (at the meetings of which he was a regular attendant), and of the sound judgment and expert advice which he placed at the service of the University. We are asked by Mrs. Allen and the family to convey to the gas profession through the medium of the "JOURNAL" their sincere thanks for the kindness and sympathy shown to them in their bereavement.

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The French Ministry of War has reserved for the manufacture of explosives the whole of the output of gas tar in France. The use of tar as fuel, or its sale or use for any other purpose than distillation, has been prohibited, except under licence from the War Office.

COKING AND BYE-PRODUCTS.

By "Event and Comment."

The Estimation of Benzol.

With further reference to the comments which have been made in these notes recently concerning the various methods adopted in determining the quantity of benzol in coke-oven gas, the following description of a test recommended by J. J. Morgan in his "Aids to the Analysis of Ores, Metals, Fuels, &c.," is of interest:

> Pass a measured volume, from 10 to 20 cubic feet, of the gas through at least three bottles containing 150 to 200 cc. of nitro-benzol or creosote oil, at the rate of 1 cubic foot per hour. Transfer the contents of the bottles to a distillation flask, the neck of which is closed with a bung carrying a three-bulb Bel-Henniger fractional distillation-tube. Close the open end of the distillation-tube with a bung, through which pass a thermometer so that the bulb is exactly in line with the side tube, and connect the latter with a water-cooled (Liebig) condenser. Distil. Heat cautiously at first, collecting the distillate in a 100 cc. glass cylinder graduated in tenths. When the temperature has reached 120° C., allow the contents of the flask to cool to 100°, and again distil until 120° C. is reached. Repeat this some four to five times to insure the benzol being driven off. Allow the condenser to drain, and, when cool, note the volume of benzol distilled. Should water come over with the benzol, remove it by means of a fine-pointed pipette, return the benzol to the flask, and redistil. The gallons of benzol per ton of coal equal $\frac{V \times Q}{v \times 4543}$ where V = cubic feet of gas per ton of coal, Q = number of ccs. of benzol obtained, v = number of cubic feet of gas used in the test, 4543 = number of ccs. in a gallon. The benzol may contain small quantities of toluene and xylenes.

The method suggested is undoubtedly a good one, but it really needs some little qualification, especially if it be used by a comparatively inexperienced hand. In the first place, the temperature of the gas used should be about that of the atmosphere, and the creosote oil used for absorption purposes should be previously distilled and all fractions coming off below 200° C. eliminated. With regard to the temperature of distillation of the benzolized oil obtained in the test, a difference of opinion exists as to what this should be. If the object of the test is to determine the amount of benzol—apart from toluol, xylol, &c.—in the gas, then it fails, for (as Mr. Morgan points out) "the benzol may contain small quantities of toluene and xylenes." At the temperature taken a good proportion of the toluene, and also some of the xylenes and solvent naphtha, will distil over with the benzol. If, however, the object of the test is to determine the total amount of crude benzol—*i.e.*, including the toluol, xylol, &c.—recoverable, then it hardly seems right to take the temperature only to 120° C. The sample of benzol recovered in the test described will all distil below 120° C., whereas in the case of ordinary crude benzol, only about 65 per cent. of it distils at this temperature. In modern benzol plants, the rich creosote oil is usually heated to about 135° C. The writer would suggest, therefore, that in the test the temperature of distillation of the oil be taken to 135° C., and the product then obtained corresponds to the crude benzol of ordinary bye-product coking practice. If further information as to the composition of this product is required a fairly large sample must be collected and submitted to fractional distillation in the usual way.

Mixing of Coals for Bye-Product Coking.

The tendency in bye-product coking nowadays is to follow the American practice—*i.e.*, speeding-up of the work generally. In making comparisons, it must, of course, be recognized that conditions in America are somewhat different from those obtaining here; but, nevertheless, the general features are very similar. The mixing of different classes of coal is not much practised in this country on definite lines. More or less haphazard mixing is certainly carried out at a number of places. Collieries working various seams at different pits frequently send all the small coal to a central battery of ovens, but systematic mixing is not carried out. In America, on the other hand, scientific mixing is carried on. The properties of the various classes of coal are studied under working conditions, and many experiments carried out in order to determine what are the best proportions in which to mix the various coals; and such proportions, when once determined, are rigidly adhered to. In this way it is possible to produce the best quality of coke, control the ash, sulphur, and phosphorus content of the coke, and regulate the quantity of gas and bye-products obtainable. It is known quite well that certain classes of coal, when used alone, do not produce good coke, though the amount of tar, ammonia, benzol, &c., obtainable are exceedingly favourable. By judicious selection of coals it is possible to include such as these in the coking class by mixing them with first-class coking coals. At many of the more modern American bye-product coking plants, elaborate mixing stations have been installed. In coking, as in other things, the American policy is "hustle." Everything that can be done to increase the capacity of a plant is regarded with favour. Whereas in this country there are few ovens capable of holding even as much as 10 tons of coal per charge, in America 13-ton ovens are quite common, and 15-ton charges are not unknown. In the matter of carbonizing period we are a long way behind. It is doubtful if there is a plant in this country burning-off large ovens in less than 24 hours. The 13-ton ovens in America are burnt off in 14 to 18 hours. This is, of course, partly due to the coal—which is often quite dry—but also to the fact that higher carbonizing temperatures are more usual. Then, again, silica bricks are more frequently used for the construction of the ovens; and this perhaps is one of the most important features. Undoubtedly, some useful hints can be gained from modern American practice.

MR. N. H. HUMPHRYS AND GAS MANAGEMENT AT SALISBURY.

On the 13th inst., we reported that Mr. Humphrys had decided to retire from the position at Salisbury with which his name is so intimately associated, and which he has held for over twenty years with credit to himself, and to the advantage of both shareholders in the Company and consumers of gas in the district. We are now able to add a few details that will be interesting to the numerous members of the profession with whom, during a connection with the gas industry that has extended close up to fifty years, he has established friendship or acquaintance.

He entered the profession in 1866, on leaving school, as pupil and assistant to the late Mr. Samuel Pontifex, who was at that period interested in the development of small gas undertakings; and in 1873 was engaged by Messrs. Edward Cockey and Sons, of Frome, with the object of assisting in the management of various small gas-works that they held on lease. Later, when the leases had expired, he was Manager of gas-works at Westbury and at Melksham, and in 1883 went to Salisbury as Assistant Manager under the late Mr. Thomas Hardick. On the death of that gentleman in 1895, at the advanced age of 90, Mr. Humphrys was appointed to the position he is now vacating.

None of those who are personally acquainted with Mr. Humphrys, and also with the position of affairs that has been general at Salisbury since the outbreak of war, will be greatly surprised to hear that he has decided in favour of a smoother and less strenuous occupation, free from the numerous anxieties and distractions that have fallen to his lot during the last twelve months. As his friends have frequently observed, no one can expect immunity from worry of some sort in these times, but he has had more than the common share. We recall rumours of empty coal stores, of the stock of coal running down to within 36 hours' requirements, and the situation being saved by prompt action on the part of the Mayor; of men dropping away by the half-dozen, without even an hour's notice, for enlistment, or for Government work at the numerous camps pitched on Salisbury Plain—particularly favouring Saturdays and Sundays for the purpose, just the time it is most difficult immediately to fill up the gaps and maintain the regular continuity of operations—until not more than 40 per cent. of the original staff remain; of difficulty in filling the vacant places, especially where hot, heavy, and dusty work was concerned, more by reason of the general demoralization brought about by the excessive rates of pay and easy conditions of work offered by the Government contractors on the plain, than by actual shortage of men on account of enlistment; of prolonged delay in the delivery of coal, and of all other materials or goods, both inwards and outwards, that are carried by rail, and frequent declarations that Salisbury was a "closed" station, sometimes for weeks at a time; of tar having to be sent 25 miles by road motor; and such like matters. It is therefore evident that Mr. Humphrys' physical strength (never over-robust, and now somewhat weakened by advancing age) has been strained close to the breaking point. Large quantities of coal for South Coast towns, formerly supplied exclusively by water, are now carried by rail through Salisbury—thus aggravating the congestion of traffic due to military requirements. Other places have suffered from some of these troubles; but nowhere have they been more acute than at Salisbury. The geographical position as a junction between Southampton, Portsmouth, and the whole of the Western part of the country, the importance as a military centre, due to the headquarters of the Southern Command being in the city, and the fact that the whole neighbourhood for twenty miles round is dotted with encampments, all tend towards a very precarious position so far as supplies of materials and labour are concerned.

Mr. Humphrys has no reason to be ashamed of his record at Salisbury. He has always maintained a gas supply well over legal requirements, in respect to quality and purity, even under the trying conditions above instanced. He has consistently sent out a gas equal to 14½ to 15 candles tested by the No. 1 "London" argand burner as prescribed by the Company's Act, having a calorific value of 600 B.Th.U. per cubic foot within a margin of 20 units either way, and averaging less than 15 grains of sulphur in all forms per 100 cubic feet. The calorimeter was systematically used at Salisbury years before it was generally recognized in gas-works. Notwithstanding advanced cost of coal and labour, the selling price has been steadily reduced from an all-round rate of 3s. 6d. per 1000 cubic feet to 2s. 11d., with a liberal scale of discounts to large users. Of course, the special circumstances of the last few months have necessitated a break in this policy; and the price was raised to 3s. 2d. on the 1st of April last. A further advance may be found necessary when the accounts for the year that ended June 30 are completed. The income from all sources for the year ended June 30, 1885, was £11,280; but the corresponding item for the year just completed will be nearly £30,000. The capital outlay at the earlier date was £34,381, approximately three times the annual income; but to-day it is just over £60,000, or about twice as much. With increased tonnage of coal, and bulk of gas to be handled, to the extent of quite threefold, the increase of capital is only in the proportion of 75 per cent. The amount received for rent of cookers, &c., during the year 1884-5 was £26; at present the annual rental for appliances on hire is over £1200, exclusive of sales of fittings and charges for maintenance of incandescent gas lights, which include the care of about 6000 burners. Maximum dividends have been the rule for over forty years, and the reserve fund and balance of profits have been largely increased.

The whole of the extensions on the works and in the district necessitated by this increase of business have been carried out to the design and under the superintendence of Mr. Humphrys, who is a believer in maintaining a sufficient staff to deal with ordinary repairs and extensions. The principal items at the works have been the entire reconstruction of the retort-benches on the generator system, a new retort-house with settings arranged back to back on either side of the centre line, in through arches to admit of through retorts being introduced, and a roof span of 72 feet, leaving ample room for the introduction of drawing and charging machinery without structural alteration. The space has been useful as affording means of tipping the coal directly in front of the retorts, but is now being utilized for the erection of a set of Aldridge and Ranken electrically driven retort-house machinery. The increased cost and uncertainty as to the supply of coal in 1912 led to an examination of the claims put forward by makers of carburetted water-gas plant; and a 150,000 cubic feet set was put down, with provision for duplication. The second set has just been completed—thus bringing the total producing plant up to a million cubic feet in 24 hours, or 50 per cent. in excess of the present maximum capacity. But neither this nor the new retort-house machinery is included in the £60,000 outlay just mentioned. A Kirkham, Hulett, and Chandler 500,000 cubic feet centrifugal 'Standard" washer, with gas-engine, has been erected; the purifiers have been rearranged and enlarged, with the result that the purification charges are less than ¼d. per 1000 cubic feet of gas; and a 30,000 cubic feet per hour station meter, two new distribution governors, safety bye-pass, a Waller turbine-driven booster, and a 400,000 cubic feet double-lift gasholder in a cast-iron tank have all been added to the plant. The sulphate of ammonia apparatus has twice been entirely reconstructed. One of Mr. Humphrys' hobbies has been the construction of a reinforced concrete store for meters, cookers, pipe, fittings, &c., 60 feet by 30 feet by 20 feet high at the gables; the whole of the staple material used consisting of old retort-house settings. The act of crushing to a suitable size supplied a sufficient quantity of dust and small to furnish an excellent substitute for sand.

In the district there have been numerous enlargements and extensions of mains, which include several miles of steel and wrought-iron pipe, ranging from 3-inch to 8-inch diameter. The first trial of this material was put down some fifteen years ago, and the pipe is to-day as sound as when laid—the covering being an efficient protection. Salisbury was among the earliest to adopt the incandescent burner for public lighting, and Mr. Humphrys carried out all the necessary arrangements. Being convinced of the necessity of using cylindrical glass protectors as now generally adopted, but which were at that time not listed by makers of burners, and were not considered requisite, Mr. Humphrys obtained a supply specially made to his own design. Self-intensifying and inverted burners and other improvements have been introduced from time to time, but a large portion of the system thus inaugurated is still in use. The principal streets of the city are generally admitted to be effectively lighted, and suggestions for high-pressure lighting have not been seriously considered, on the ground that the present system answers all reasonable requirements. The slot-meter system was introduced as soon as a satisfactory and reliable make of meter was available, and this department now includes 3000 consumers, of whom over 90 per cent. use cookers. The whole of the installation work was carried out by the permanent staff, and the greater part of the customers use 5-light shilling meters. There are a few dozen penny and a small number of 10-light and 20-light half-crown meters. The penny meter is not in favour—the customers finding it more convenient to put in a shilling on Saturday (sufficient to run the week).

As regards the principal member's of the staff, the changes since 1883 have not been numerous; the majority being those due to the ordinary course of Nature. Some of them can boast a longer record of service than their late chief; and in respect to these, the unfailing devotion to duty and reliability on emergency afforded by the works foreman, Mr. J. C. Watts, is worthy of particular mention.

Mr. Humphrys has taken some part in the general progress of the gas industry, though of late years he has not been so much in evidence—either in our columns or at meetings of gas engineers. But during a considerable period, he was a frequent contributor to the one, and a regular attendant at the other. He read several papers, and occasionally figured in discussions. He was elected the Honorary Secretary and Treasurer of the South-West of England District Association of Gas Managers in 1884, and held the office till the Association was merged into the Southern District in 1896, on which occasion he was the recipient of a handsome silver tea and coffee service. He passed the presidential chair of the South-West Association, and was subsequently twice elected President of the Southern District Association. He also has served on the Council of the Institution of Gas Engineers. For over thirty years he has contributed a monthly English letter, reviewing the topics of the day, to the columns of the "American Gas Light Journal." He has from the first upheld the importance of technical education in connection with the industry, and also of conducting the sales department on a sound and energetic commercial footing; and it would be difficult to find any advancement that he has not to a greater or less extent foreshadowed, or move towards progress in any direction that has not met with his support and encouragement. His investigation in connection with the Settle-Padfield vertical retort at Exeter, which directed attention to the improved carbonizing results thus rendered practicable, will be especially remembered. He has not taken a large number of pupils, but those who have passed under his care have done well, and some are occupying important positions in the profession. Always opposed to anything in the way of rule-of-thumb, he has believed in thorough investigation of every detail by the light of either experiment or calculation. He is an expert chemist, draughtsman, and mathematician, and a knowledge of shorthand has been of the greatest assistance in connection with literary researches. His duties at Salisbury have left little time for outside work; but many gas companies in the district have for years been in the habit of taking his advice before carrying out important alterations or extensions.

Mr. Humphrys has been fortunate in his home and domestic life, and he has asked us to say, in connection with any reference to his career, that it is quite impossible to indicate the extent of his indebtedness to the lady who has so faithfully supported and cared for his welfare during his residence at Salisbury, and how much her constant care for his health is concerned in any success attaching to the work he has been able to do. Of late much has been said and written about the emancipation of woman, and the work that she is capable of doing in regard to public affairs. But there has been little recognition of the important work that has been, and is being, done by thousands of wives and mothers who do not seek publicity, but are more than satisfied to devote their whole attention to the care of their homes and their children, leaving the husband free to apply his full energies to his business, social, or public duties and obligations.

THE NEW GAS-WORKS AT BUDAPEST.

By M. Isidor Bernauer, the Manager.

[Abstract-Translation of a Description in the "Journal für Gasbeleuchtung" for May 8, 15, 22, and 29.]

(Continued from p. 126.)

COMPRESSOR PLANT.

The compressor installation consists of two turbo-compressors, each of 530,000 cubic feet per hour capacity—the maximum difference of pressure being 102 inches of water. Each compressor is coupled direct with a three-phase alternating current motor of 200-H.P. The maximum number of revolutions is 2930 per minute (190 volts, 50 periods). The quantity dealt with can be lowered to 177,000 cubic feet per hour by reducing the revolutions to about 1550 per minute, and the difference of pressure to 25½ inches of water. The horse power then required is about sixteen. These figures indicate the limits within which it is possible to regulate the work of the plant. Normal working may be put at a capacity of 353,000 cubic feet per hour, with 2200 revolutions per minute, an expenditure of about 73 H.P., and a difference of pressure of about 55 inches of water. Each blower consists of a cast-iron cylinder with four rotating steel wheels and a steel shaft. It has a hydraulic stuffing-box intended to prevent the escape of gas into the room. The motor and blower are on a common base-plate, and are connected by an elastic coupling. There are independent switches and starting apparatus for each set of plant. These are in a separate room; but the starting apparatus can also be operated from the engine-room. The building has been designed so that a set of 1,060,000 cubic feet per hour capacity can later be installed in it.

A travelling crane, operated by hand, has also been fitted up for a load of 8 tons, in view of the introduction later of this large set of apparatus. The crane has a span of 41 ft. 8 in., and a lift of 14 ft. 9 in.; and its weight is about 9 tons. The framing is a strong one; the two chief members being rolled double-T joists, to the top flanges of which flat-iron rails are attached. The transverse members are of U section iron attached by straps to the principal members. The running wheels are loose on their axles, and to two of them toothed wheels are attached, by which, through chain gearing, the crane can be moved to and fro from the floor by a hand chain and chain wheel. The traveller of the crane has besides a very strong framing and double-flanged wheels which run on the rails on the chief girders. It is moved to and fro by a hand chain reaching to the floor of the room. The load is supported from the loop of a Gall's chain, one end of which is fixed to the traveller, while the other runs on a chain wheel attached to a worm wheel. To one end of the shaft of the steel worm is keyed a chain wheel, on which a hand chain reaching to the floor runs for the purpose of raising the load. The chain carrying the load has been tested to double, and the traveller to one-and-a-half times, the possible load. Very special attention has been given to providing for easy access to all parts requiring lubrication. The crane travels on flat-iron rails riveted to rolled iron girders supported by masonry columns 20 feet apart. The track is about 65 feet in length.

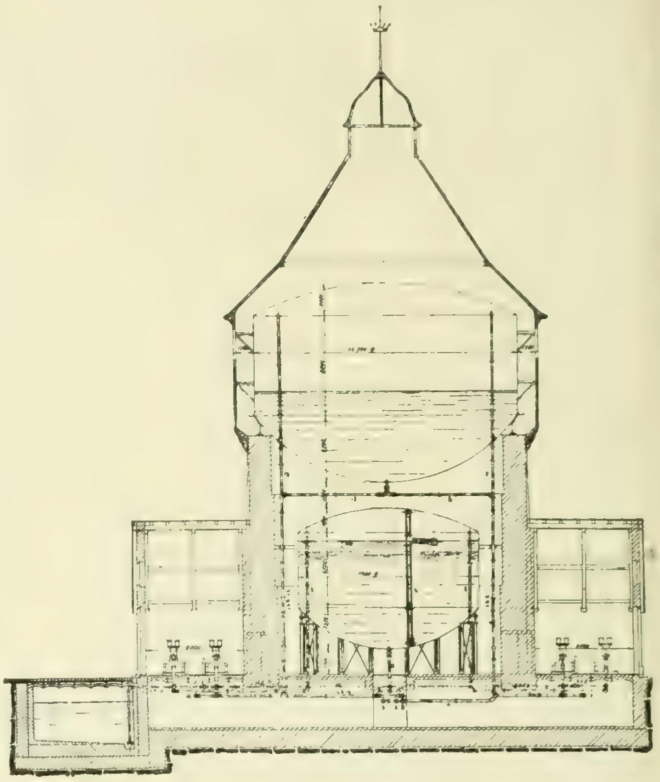
The connections inside the house vary from 16 to 40 inches in diameter, and, with the exception of bends, are of welded steel of nearly ¼ inch thickness. One suction main, 40 inches in diameter, enters the house; but there are two pressure mains, each 32 inches in diameter, connected so that either one can be used as a stand-by for the other. The gasholders on the works can also be put in direct communication with the high-pressure mains. One of these is reduced to 24 inches as it leaves the house, the other has not yet been carried outside the walls. The outlet pressure on the high-pressure main is recorded on an indicator having a range of 0 to 157 inches of water. There is another recording pressure indicator, of smaller range, fitted upon the suction-main.

In each pressure-main leading from the turbo-compressors to the principal high-pressure main there is a non-return valve, so as to prevent one compressor, when idle, being driven backwards through the working of the other compressor. At present the second compressor is merely a stand-by. There is a 12-inch branch main from the 24-inch high-pressure main, leading to the gasholder station at the former Buda Gas-Works. There are here two gasholders, of 635,000 and 177,000 cubic feet capacity respectively. The 12-inch high-pressure main leading to them is rather over 4½ miles in length. The 24-inch high-pressure main crosses the Danube and the Ujpest branch of the Danube on the railway bridge, and goes on to the gasholder station in the Lipótváros (V) district on the Pest side. At this station there is a gasholder of 2,120,000 cubic feet capacity. Where the main crosses the street known as the Váezi Út, a branch is taken off to connect with the 32-inch main which crosses the Hungaria Körút for the supply of the gasholder of 5,300,000 cubic feet capacity which has been erected in the Köbányaváros (X) district.

A 24-inch main leads from the Buda holder station, and a 40-inch main from the Lipótváros holder station, to the town. A 48-inch main leads from the Köbányaváros gasholder to the site of the dismantled works in the Józsefváros district, where it is connected with the old distributing system. The mains, where laid underground, are ordinary socket pipes. On the bridges they are wrought-iron pipes, nearly ⅓ inch in thickness, welded by water gas and supported on brackets. Expansion boxes are provided on each column of the bridge, and the mains are covered with an insulating coating to protect them from the cold.

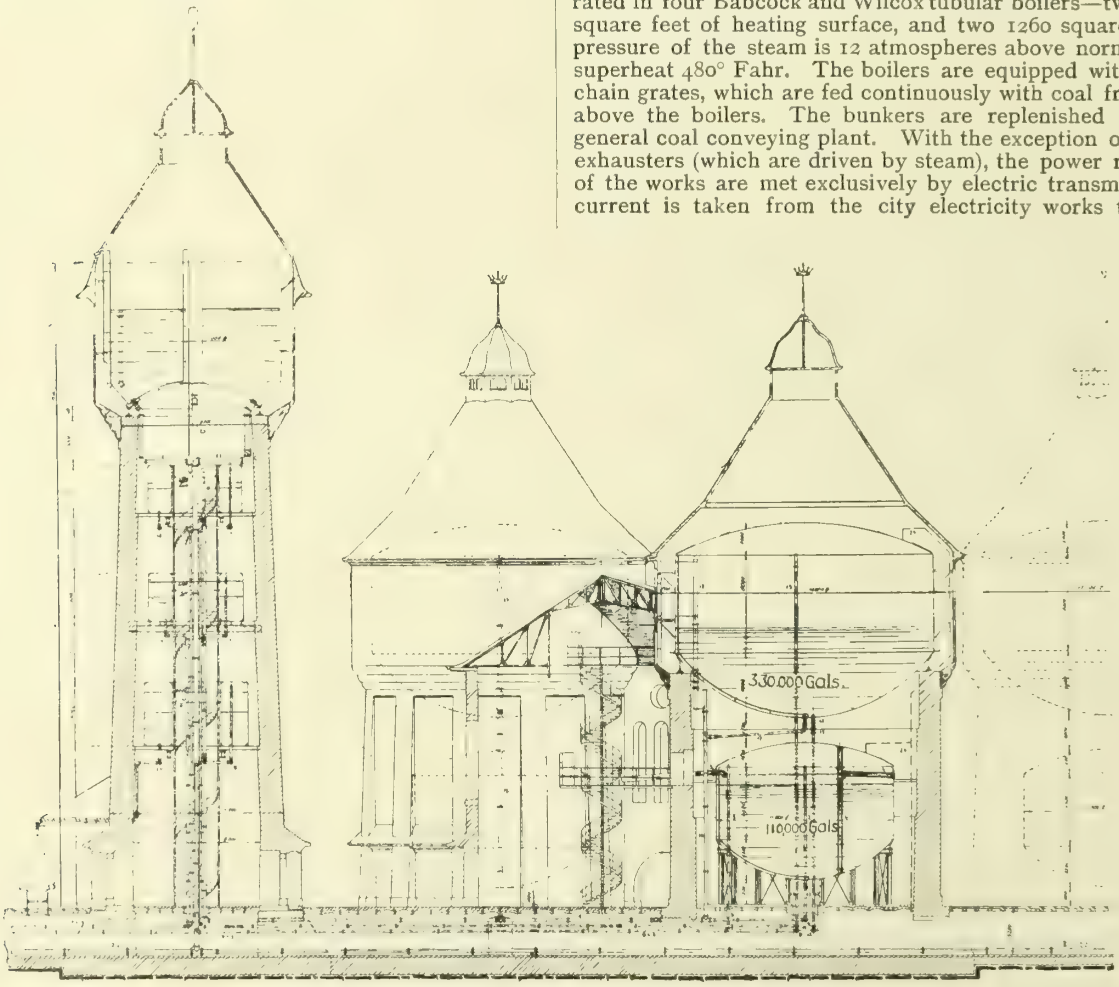
TANKS, POWER, WATER SUPPLY, AND DRAINAGE.

In addition to the water-tower, in which there is a reservoir of 165,000 gallons capacity, there is a group of three shorter towers with tanks for tar and liquor. Each of these towers, which are shown in the diagrams, contains one tank of 330,000 gallons capacity, with hemispherical bottom, and below it another tank of 110,000 gallons capacity. The tanks are used as separating and storage tanks for tar and liquor—one being reserved for the storage of the oil used as fuel for a Diesel engine. The necessary pumps are in an attached building. The tar and liquor deposited in the hydraulic mains and condensers are pumped into these tanks. Also there are below the water reservoir in the water-tower three elevated annular tanks into which the tar and strong liquor are pumped, and from which tar is run into tank-waggons and the liquor to the sulphate plant.



Tar and Liquor Tank Tower at the Budapest Gas-Works.

The steam required for power and heating purposes is generated in four Babcock and Wilcox tubular boilers—two with 3143 square feet of heating surface, and two 1260 square feet. The pressure of the steam is 12 atmospheres above normal, and the superheat 480° Fahr. The boilers are equipped with automatic chain grates, which are fed continuously with coal from bunkers above the boilers. The bunkers are replenished through the general coal conveying plant. With the exception of the turbo-exhausters (which are driven by steam), the power requirements of the works are met exclusively by electric transmission. The current is taken from the city electricity works through two



RESERVOIR TOWERS AT THE BUDAPEST GAS-WORKS.

conductors at 10,000 volts, and is transformed on the gas-works to 210 volts. As a standby there is installed an 800 H.P. Diesel engine driving a Ganz electric generator.

A supply of drinking water is taken from the Corporation water-works; but a special works' supply has been provided under a scheme prepared by M. Kajlinger. The works for this supply is at the north end of the site, directly below the railway bridge and on the bank of the river. There is a 16-inch suction pipe through which water is drawn direct from the Danube by two electrically driven rotary pumps and delivered into a settling tank behind the pumping-house. Another two pumps force the clarified water through an 18-inch main to the works' distributing system or into the reservoir in the water-tower. Each pump has a capacity of 860 gallons per minute.

There are two systems of drainage. One is restricted to rain and condenser water, which is taken into a main sewer running alongside the Danube, into which it has two free outlets. The other system, for fouled water, has two ejector stations, where two automatic Shone ejectors drive the water into a pressure main nearly 2 miles long which discharges it into the branch of the Danube.

The buildings are all heated by steam, which is taken from the central boiler installation. There are two Babcock and Wilcox boilers, each with 592 square feet of heating surface, in a special building, for providing steam for heating the gasholders.

The lighting of the works is chiefly by gas; but to a small extent electric lamps are used. For outside lighting there are 102 triple-burner low-pressure high-power gas-lamps, each of 900-candle power, and 114 ordinary lanterns with Welsbach burners. The gas-mains on the works have a total length of about 9½ miles.

EXPERIMENTAL WORKS, SHOPS, BATH-ROOMS, AND DWELLING HOUSES.

A fully equipped experimental gas-works has been provided for the purpose of checking the working of the works' plant, and controlling the quality of the coal received. There is an experimental setting of two retorts, but the subsidiary apparatus has a capacity of 123,600 cubic feet per diem; so that the gas from one of the works' carbonizing ovens can be passed through it. A well-equipped chemical laboratory is attached to the experimental works, having provision for the examination of all gas-works materials and products.

Engineers' and fitters' workshops have been provided in order to render the works independent of outside aid for all repairs to plant. They are equipped with the most modern machine tools; and there is a foundry attached. Adjoining the engineers' shop is a store; and behind the electric power station there is a large building, in reinforced concrete, for the storage of structural materials, joinery, &c. A carpenters' shop is close to this store, and in the same building are stables, garage, and fire station.

A telephone exchange, with lines to a hundred call boxes in different parts of the works, and in connection with the City telephone system, is established near the main entrance.

There is spacious washing and bathing accommodation for the workmen in a special building, having also a large dining hall, with kitchen and offices. At different parts of the works are smaller lavatories and bath and rest rooms.

At the south end of the site, between the railway station and the branch of the Danube, houses have been erected for the works' officials. Each house has its own garden—the gardens as a whole occupying 9 acres. On land separated from the works by the railway embankment, a colony of a hundred workmen's dwellings with from one to three living rooms, has been erected at a cost of £62,500. Each dwelling has its own vegetable garden. The larger ones have bath-rooms, and baths in a special building are provided for the occupiers of the smaller dwellings. A children's playground is provided.

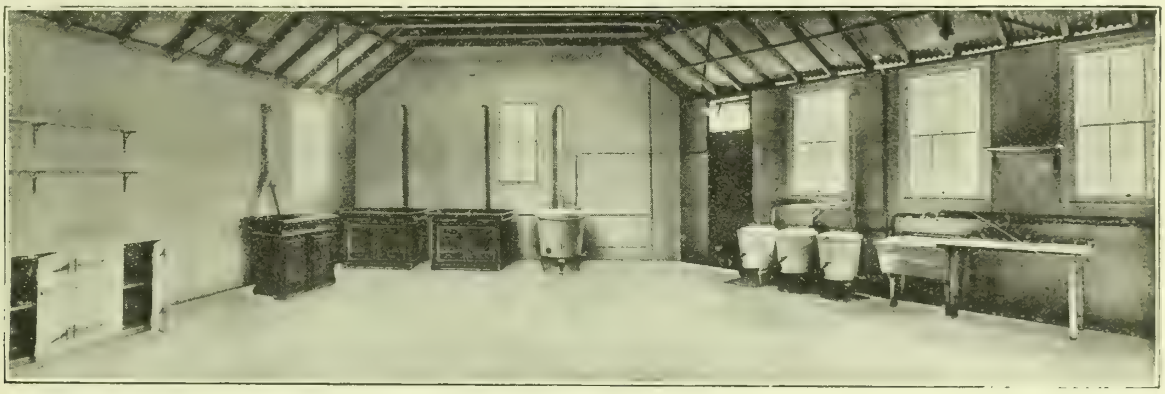
CONCLUSION.

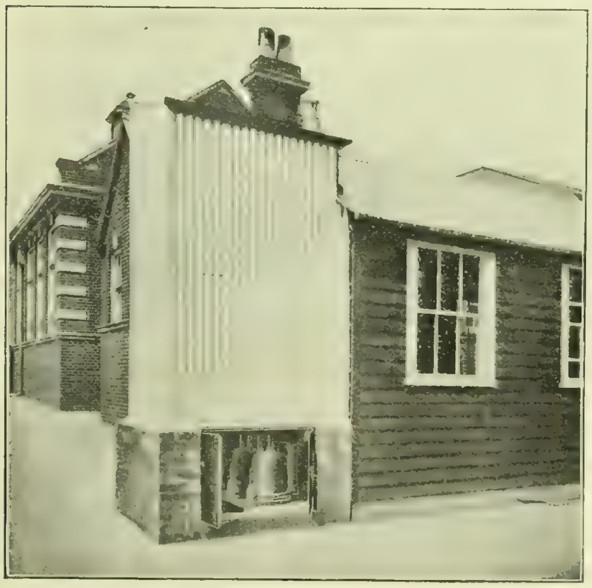
The actual cost of construction of the Óbuda Gas-Works was estimated at £1,042,000, of which £83,000 was for the dykes and the raising of the level of the ground. Actually the expenditure was so considerably below the estimate that the cost of the workmen's dwellings was covered by the saving effected. The construction was finished by the appointed time; and the new works started operations on Oct. 16, 1913. The Ujpest Gas-Works ceased working on Nov. 1, and the Buda works on Dec. 20, 1913. Finally the Józsefváros (the oldest) works were put out of action on March 31, 1914. After one-and-a-half year's working of the new Óbuda works, it can be stated that they have fulfilled all that was expected of them in respect of productive capacity, quality of gas produced, and, more especially, economy of working.

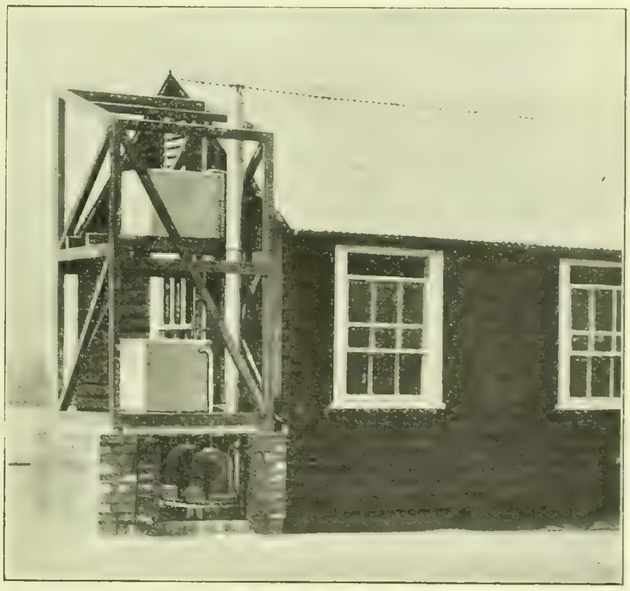
GAS IN TEMPORARY HOSPITALS.

THE accompanying photographs of gas cooking and water-heating apparatus in connection with temporary hospitals recently erected at King's Heath and Selly Oak, near Birmingham, have been forwarded by Messrs. John Wright and Co. At the places mentioned, the schools have been taken over by the War Office and converted into hospital wards; while the temporary buildings illustrated have been erected as kitchens.

At one end of the interior it will be noticed that two double "Bordo" ovens, one "Aston" cooking range, and four "Gyp" boilers have been installed. There are throughout the building three sinks, one of which is shown; and to supply hot water to them, a battery of two No. 3040 "B.T.U." circulating boilers has been fixed. These are seen in the two exterior views—one showing the end of the temporary building at Selly Oak Schools, and the other the exterior of the building at King's Heath Schools. The latter photograph was taken before the hot-water arrangements were covered in.







TAR DISTILLING ON GAS-WORKS.

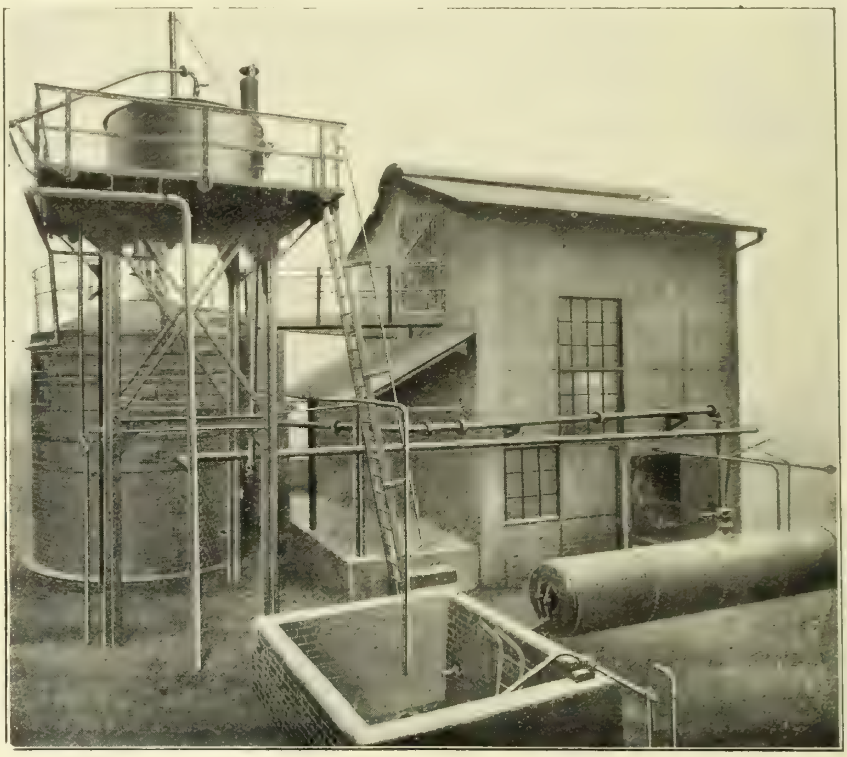
The Power-Gas Corporation's Plant.

A PLANT to enable gas managers and other producers to distil their own tar has been placed on the market by the Power-Gas Corporation, Limited, of Stockton-on-Tees: and the accompanying illustrations are of an installation at the Saltley works of the Birmingham Corporation Gas Department, designed to deal with the tar from a 90-ton battery of Mond producers, which supply gas for coking the charges in a battery of 66 bye-product ovens. In actual practice, however, the tar plant has been proved to be well above this duty. It will be noted that it is entirely self-contained, and takes up comparatively little ground space. It is moreover claimed to be simple to operate, and either pitch or dehydrated tar suitable for road-making can be produced as desired.

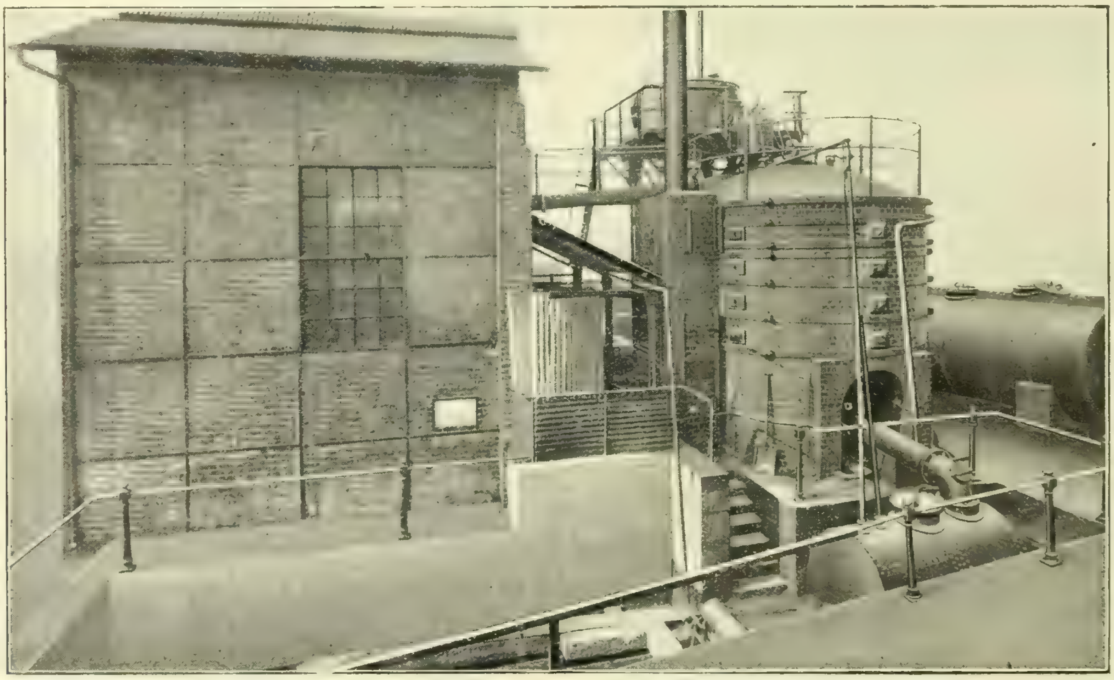
The still is conical in shape, terminating in a circular parallel portion at the bottom, which forms a receptacle for the pitch or dehydrated tar. The top is closed in by a substantial dished plate, with a manhole and cover at the centre. In the interior, and on the inclined portion of the shell, concentric steel rings, spaced a certain distance apart, are riveted, forming trays over which the mixture of tar and water flows. From the pre-heater the tar is conducted on to a steel tray, nearly as large as the diameter of the still, with an upturned edge about 1 inch deep, so that the heat in the still drives off a large percentage of the water before the tar finally overflows the outside edge on to the concentric rings previously mentioned. The still is fitted with safety valve, and special arrangement at the bottom which comes into immediate action in case of undue pressure.

The still is designed on the film system, which enables it to work more than twice as fast as an ordinary pot still. It is fixed in a fire-brick setting, having special-shaped fire-bricks placed next to the conical steel shell wherever the heat is applied. With this arrangement, it has been found that over-heating rarely takes place, and the chance of cindering is thereby reduced to a minimum. The still works under vacuum, as usual. The condensate is led off through a condenser into the receiver, where the oils settle out. The pitch is collected in the pitch-cooler in the ordinary way, and run off when sufficiently cooled. The incondensable and noxious fumes are passed through the vacuum pump, conveyed underneath the furnace of the still, passed through the fire, and destroyed.

It is stated that stills have been working continuously day and night for over eighteen months, without cleaning or opening out. When cleaning is necessary, the still is opened top and bottom, which allows a draught of air to pass through. Consequently there is no danger of a workman being "gassed." As regards labour, only one man is required for operating a still to deal with 30 tons of tar per day. The plant is economical in water and fuel; and special firing at stated periods is not necessary, as in a pot-still plant. In addition, the plant is so designed and arranged that it can be shut-down practically at any time and started up the following morning without loss of time. This is important for small works, where an all-round night shift is not in operation.



It may be added that the possibilities of the apparatus are not restricted to plants of large capacity. Practically any size of still can be made, to treat 1 ton of tar per day upwards. The plant deals with tar direct from the works, containing up to as much as 40 per cent. of moisture; and it is pointed out that it thus dispenses with the dehydrating apparatus required with a pot-still plant.



Garcke's "Manual of Electrical Undertakings and Directory" for 1915-16.—There has been received from the Electrical Press, Limited, a copy of the nineteenth edition of this work, which has just been published. As usual, it contains a vast amount of statistical and general information relating to many undertakings. In addition to war comments, there are various special articles of importance dealing with electrical matters, and some valuable maps, including a large one of the United Kingdom (as a separate supplement) showing the situation of all lighting, power, and traction undertakings. The price of the volume (which extends to some 2000 pages, with 48 maps) is 21s. net; and it is published at Nos. 13 to 16, Fisher Street, W.C.

POWER PRODUCTION.

The "£ s. d." of the Question.

By H. C. Widlake, M.J.Inst.E., of the Plymouth and Stonehouse Gaslight and Coke Company.

(*Continued from p.* 130.)

Factory Driving.

As a general rule, the scope of the ordinary provincial gas undertaking, so far as the sale of gas for power purposes is concerned, will be confined to the moderate-sized factory, whose maximum demand does not exceed (say) 100 B.H.P. Producer-gas plants are not at present sufficiently developed to enable them to compete with the gas-engine working on a town supply so far as small power installations are concerned.

A regular supply of gas of high and constant calorific power obtainable instantly day and night without the risk, trouble, increased capital outlay, and constant attention involved in the use of producer gas, is a decided advantage. Apart from the additional outlay involved in installing the producer, scrubber, &c., the engine itself is more expensive, and takes up a greater amount of space, on account of the fact that an engine running on suction gas can only develop about 75 per cent. of the power output attained when running on town's gas of an average calorific value.

Disadvantages of Electric Motors.

The persistent efforts on the part of electrical contractors and supply authorities to persuade the proprietors of quite small factories to go in for group, or even individual, driving by means of electric motors would be amusing if such a course were not characterized by so callous a disregard for the finances of the unfortunate individual concerned. The fact of being able to put any particular machine into operation at any time without reference to another machine or machines is undoubtedly an advantage; but practical considerations do not, except in very special cases, permit of such an arrangement being adopted.

The driving of isolated machines by separate motors means that each motor must be so rated as to be able to supply the maximum amount of power demanded by the particular machine to which it is coupled. This would mean that during the greater part of its time a small, and consequently a comparatively inefficient, motor would be operating at a poor efficiency under an uneconomical load factor.

The extent to which it is wise to adopt isolated or group driving can only be decided by a consideration of the circumstances peculiar to each particular case, and by close attention to the load factor under which it is estimated each machine will operate. The maximum advantages offered by group driving can only be realized by a judicious grouping of the machines at the time of their installation in such a manner as will permit of certain groups being kept working at their highest efficiency at a time when the conditions of working require other groups to be shut down.

Where the daily load factor on all the machines is equal, and no particular group of machines is likely to be working when others are standing idle, the adoption of group driving, so often recommended by interested persons, simply to save [*sic*] the transmission losses in connection with (say) three or four main driving belts is a suicidal policy so far as the commercial aspect of the matter is concerned.

Even with group driving, belts and shafting, with their attendant and unavoidable losses, are inseparable, and the transmission losses evaded by the abolition of three or four main drive belts will be more than swallowed up by the increased capital and depreciation charges, to say nothing of the lower efficiency of the small group motors. This is a purely technical argument, and does not touch at all upon the ever-present question of the higher cost of electrical power.

Gas-Engines for Generating Current.

For special purposes, and more particularly where large ranges of speed control are necessary, group or individual driving may become a necessity; and in such cases it is up to the progressive gas engineer to press for the installation of gas-driven generating sets, by means of which he should be able to show that electrical energy can be generated at a far cheaper rate than it can be obtained from a local authority, to say nothing of the advantage of a supply totally independent of outside influence and mishap.

Moving picture exhibitors have not been slow to take advantage of the economic possibilities of the gas-engine in this respect. Needless to say, however, the saving effected by the installation of private gas-driven generating sets is not confined to members of this particular industry, but can be accomplished in connection with any other business where the proprietors are large users of electricity for power or lighting purposes, and, in the latter case, do not feel disposed to use the cheaper, more hygienic, and equally efficient form of lighting to be obtained by the direct use of gas and inverted incandescent mantles.

As an example, let us take the case of a 30 B.H.P. gas-engine coupled to an electric generator for the supply of lighting and power to a small factory. Working at its normal load of 30 H.P. this engine would be able to transmit 30 × 746 = 22,380 watts to the dynamo shaft, if the set were direct-coupled. Assuming a dynamo efficiency of 85 per cent., we find that out of this 22,380 watts, 3357 would be lost in heating and other losses in the machine; the remaining 19,023 watts, or (say) 19 kilowatts, being available for transmission to the factory plant and lights.

From Table I. (*ante*, *p.* 80) we find the hourly consumption of this engine at full load would be 609 cubic feet; while the cost for gas alone would be 9·7d. The output of the dynamo during this time, assuming 100 per cent. load factor, would be 19 kilowatt hours, or 19 B.T.U. The cost per unit for gas alone would therefore be 0·51d. This figure, it must be remembered, would be still lower in connection with larger sets having a higher engine and generator efficiency.

Electrically Lit Factories.

It often happens—due sometimes to ancient lethargy on the part of the gas supply undertaking—that a factory driven by gas power is either wholly or partly illuminated by electricity; and in view of the fact that the electricity supply authorities offer specially advantageous terms to daylight consumers, it is a very difficult matter to induce the proprietor to scrap his electrical fittings in favour of the rival power. Such cases may be advantageously handled by pointing out to the proprietor that a small dynamo driven from the line-shafting will generate all the power likely to be required at a cost of something under ½d. per unit, according to the rate charged for gas for power purposes.

The provision of a change-over switch will permit of a supply being drawn from the public mains when the main shafting is stopped; but a more economical alternative would be the provision of a small gas-engine rated to drive the dynamo independently for the few lights that would be required at such a time. In practically all cases it will be found that it will pay the proprietor of the electrically lit factory to generate his current by a gas-driven dynamo; and the economy attendant on this practice should appeal very strongly to garage proprietors.

The increasing use of the electric self-starter, electric head and side lamps, &c., and the resultant necessity for the employment of high amperage accumulators, is having a considerable effect on the electricity charges in connection with garages taking a supply from a public main and, by means of a small (and hence uneconomical) motor generator set, convert the current to the pressure and character that are necessary for accumulator charging.

The Coupling of Gas-Engines.

Much has been made in the past of the extremely even turning movement which is the characteristic of the electric motor and of the turbine, and which gives these machines an advantage over all reciprocating engines. The high degree of perfection to which the multiple cylinder gas-engine has been brought in this respect is strikingly illustrated in fig. 1, which shows a cyclical speed variation record taken from a three-crank tandem vertical gas-engine by the Westinghouse Company, working at or near full load. It will be seen that the maximum fluctuation in speed of the flywheel is 0·28 per cent. during the period in which a complete cycle of work takes place in one cylinder—namely, in two revolutions.

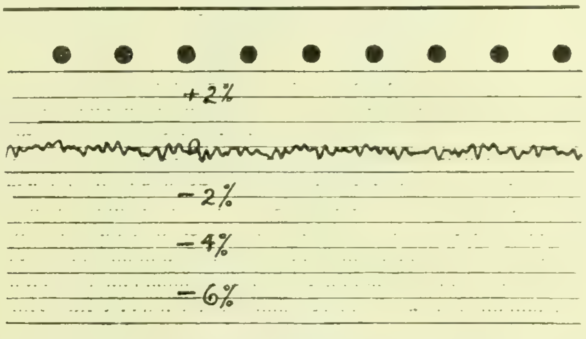


Fig. 1.—Cyclical Speed Variation Record taken with Horne's Tachograph from a Three-Crank Six-Cylinder Westinghouse Vertical Tandem Gas-Engine (at about full load).

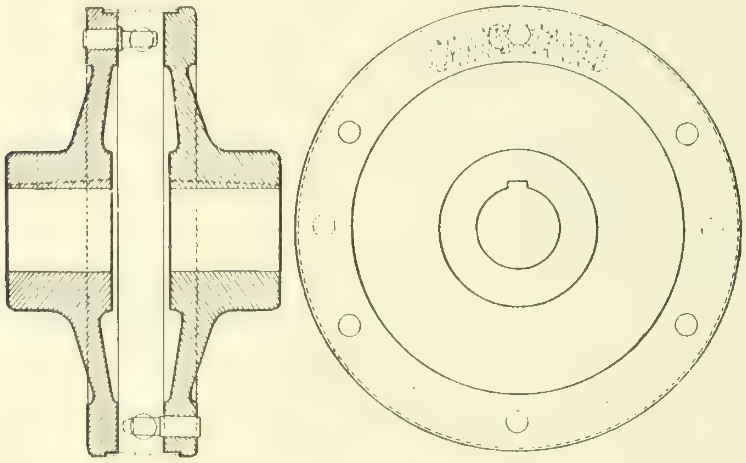
There is no doubt that so fine a degree of speed variation is attributable to the tandem cylinder design adopted by the Westinghouse Company in the design of their high-speed verticals. In a four-cycle engine having one crank per cylinder, the crank receives an impulse every second revolution, or on every fourth stroke of the piston. With the tandem arrangement, however, in which two pistons (coupled in tandem) drive on to each crank, one piston is delivering an impulse to a crank while the other is on its suction stroke, from which it will be obvious that the crank receives an impulse every revolution.

The tachometer record above referred to shows the value of having a large number of impulses of comparatively small intensity. Such fine regulation cannot, of course, be expected from the small single-cylinder gas-engines with which the usual small factory is equipped; and it may be that in special cases where an engine of this type is not belt-coupled to its work but has to drive direct on to its load, as in the case of electrical generators, compressors, pumps, fans, and blowers, the power user is faced with the problem of coupling an engine having a varying angular velocity with a machine in which this factor is quite even.

Let us take the case of a dynamo direct-coupled, by means of a rigid coupling, to the driving shaft of a gas-engine. At full speed the heavy rotating armature of the dynamo will tend to resist any cyclical variation on the part of the engine; the rotating fly-wheel of the engine will in itself form a reservoir of power, due to the energy stored up in its heavy rim. These two forces will be constantly and regularly falling out of synchronism with each other, according to the cycle which the engine is performing at any particular moment; and the result of such loss of phase will be the passage of a large amount of energy through the coupling and its bolts.

To illustrate this argument, it may be mentioned that the job on which the coupling to be presently described proved its worth comprised a 150 H.P. gas-engine, having a cyclical irregularity of 1/40, coupled to a fan weighing 7½ tons, which, it was estimated, when running at 160 R.P.M., had a stored energy of about a million foot-pounds. At full speed the fan would tend to resist any cyclical variation, whereas the gas-engine was an impulse machine with fly-wheels of 950,000 foot-pounds energy at full speed. Under these conditions, the engine would attempt to store half its reserve energy in its fly-wheels and half in the body of the fan; and it was calculated that this flow of energy through the coupling occurring once every two revolutions would be equal to over 1500 momentary H.P. Such conditions are happily confined to special cases, and have in the past constituted a grave objection to the direct coupling of a gas-engine (particularly of the single cylinder type) to a machine having constant angular velocity.

The solution to the problem mentioned above was found in the adoption of the "Vennell-Coster" coupling, consisting, as will be seen from fig. 2, of two identical discs provided with alternate projecting studs, between which are special springs for action or reaction purposes. The springs are arranged around the periphery of the discs, and are compressed to a predetermined extent, which neutralizes any tendency to vibration either of the springs themselves or of the connected parts. These springs are so arranged that their axes lie direct in the line of thrust, which ensures, in conjunction with their being mounted upon studs, their not being twisted when taking up the load. While it is of great value as a coupling between loads having different cyclical variations, its use in correcting misalignment in shafting, in reducing the jar and vibration incidental to the use of gearing, in severe reversing drives, and in all cases where a buffer device is needed to take up back-lash and shocks, renders it an extremely valuable and, at the same time, very simple device.



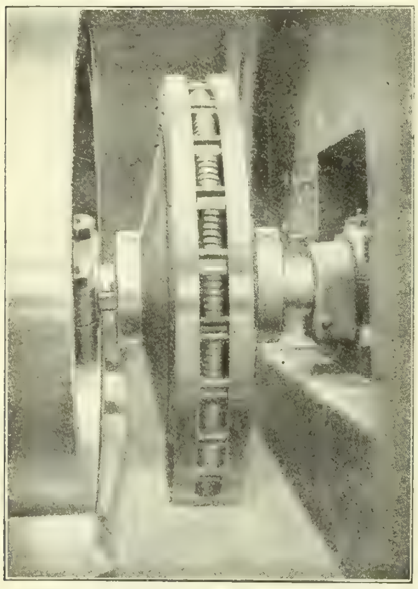


Fig. 2.—The Vennell-Coster Flexible Coupling.

High-Power Gas-Engines.

In no phase of the development of the high-power internal combustion engine has improvement been more marked than in the production of the high-speed vertical gas-engine, which, up to a very short time ago, was generally believed to be in the experimental stage. The engines have gained for themselves a very fine reputation for reliability, and are rapidly becoming appreciated by power users, not only in this country, but in colonies which, from the engine manufacturers' point of view, are as far distant as they can be.

The extent to which these engines are being used for important public services in distant parts of the British Empire is a striking proof of the high degree of reliability which this type of power developer has attained. Any type of prime mover for such a service must possess two features. It must be absolutely reliable in its working—for a public supply must not be liable to interruption—and it must not be liable to any serious damage, in view of the time and expense involved in the replacement of parts. In many cases high-speed gas-engine installations have superseded old steam-power plants, always resulting in a return in commercial service and general economy in working which greatly outweigh the capital expenditure involved.

The high commercial efficiency and general economy of the large power gas-engine as a prime mover are now generally recognized; and when we consider the simplicity of construction and general increased reliability which have now become features of the English high-speed vertical engine, it must be admitted that this engine shows a decided all-round superiority to other forms of prime movers.

Where town gas is not available, producer gas is generally used; but even for large powers there is much to be said in favour of an unlimited supply of clean gas of unvarying calorific value, such as is obtainable from the mains of a gas supply undertaking. Where town gas is used, the only accessory required is a meter. The space taken up on a steam plant by boilers, economizers, hoppers, &c., &c., together with the enormously increased running, attendance, capital, and depreciation charges which these necessary accessories entail, is entirely saved.

The remarkable ease with which these high-speed gas-engines can be started-up renders them particularly suitable for public services, where the occurrence of a sudden peak load, or the failure of a generating set, makes it a matter of vital importance that another set should be got under load immediately. The many difficulties and dangers attendant on rushing a large generating set up to speed and right on to load will be appreciated by "Journal" readers who have had any central station experience with steam plant.

No preliminary warming-up is necessary—the start being effected by turning the engine to the starting point and opening the valve to the compressed air container. With a good make of engine the storage capacity of the starter container is usually such as will permit of about a dozen starts being made without the necessity for recharging.

The present tendency in this country in high-power gas-engine design is in the direction of the high-speed multiple cylindered type; the large slow-speed horizontal gas-engine of Continental design having found but little favour. The ordinary small horizontal engine of the type forming the main subject of this article usually has a cyclical variation of 1/30 to 1/40, and is quite suitable for driving factories in which the trade process does not require a very fine degree of speed regulation.

The provision of a specially heavy flywheel on these engines reduces their cyclical variation to about 1/50, and renders them suitable for the driving of direct current generators (either singly or in parallel); the provision of a suitable flexible coupling or a belt-drive having a tendency to further absorb this degree of irregularity. For the driving of alternators in parallel, however, a much finer degree of regulation is required; and it is in this connection that the value of the multiple cylindered high-speed gas-engine makes itself felt.

(To be Concluded.)

Gas Consumption in Germany.

The Central Gas Publicity Organization of Berlin announces that statistics collected from 772 gas-works in Germany show a decrease in the gas produced in April last of 2·7 per cent., compared with April of last year. The corresponding figures for February and March last were 4·9 per cent. decrease referring to 753 works, and 4·4 per cent. decrease referring to 776 works, respectively. The figures for January were given in the "Journal" for May 18, p. 380; and those for December and earlier months since the outbreak of war in the "Journal" for April 27, p. 204. It is to be observed that the considerable falling off in the consumption of gas which was experienced in Germany during the closing months of last year has now to a large extent been retrieved. Doubtless this is due to the measures throughout the country to supply gas to households which have hitherto been dependent on oil, which has become very dear and scarce in Germany. This matter is referred to in the annual report of the German Association of Gas and Water Engineers which appears on another page of to-day's "Journal."

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

Annual Meeting in Berlin.

The Fifty-Sixth Annual General Meeting of the Association was formally held on June 30 in the new premises in Berlin of the Association of German Engineers. The following account of the proceedings is taken from the official report published in the "Journal für Gasbeleuchtung" of the 10th inst.

President's Opening Remarks.

The President of the Association, Herr F. Reese, the Manager of the Dortmund Corporation Water-Works, opened the meeting (it was attended by about 250 of the members) at 9.30 a.m. on June 30. In his opening address, he said he was gratified to see so large an attendance, having regard to the circumstances in which they were meeting; and he welcomed the presence of two members of the Imperial Standards Committee—Councillors Meyer and Zingler. The intention expressed at last year's gathering at Munich, that the general meeting this year should be held at Dortmund had been frustrated by the outbreak of war. It had then been decided merely to hold a formal meeting in Berlin, to which city railway connections were good, despite the war, and to give up for this year the festivities and excursions which were customary adjuncts of the annual meetings. After expressing the hope that "the purpose of their enemies, born of envy and jealousy, of destroying German culture, would be frustrated, and that an honourable peace would be the reward of their [the German] victory," he said that, among many other technical men, the Manager of the Instructional and Experimental Works and General Secretary of the Association, Dr. Karl Bunte, was serving in the field. His father, Professor H. Bunte, who had formerly been General Secretary, had kindly undertaken again the duties of this office, for which service the meeting thereupon expressed thanks by acclamation.

Greeting from the Swiss Association.

A telegram of greeting from the Swiss Association of Gas and Water Engineers was received and acknowledged by telegram.

Report and Accounts.

The annual report of the Council—of which some particulars are given later on—was taken as read and accepted, as was also the statement of accounts of the Instructional and Experimental Gas-Works. The accounts of the Association and of its Benevolent Fund and the Simon-Schiele Fund were also presented and passed. Estimates of receipts and expenditure for the ensuing year were next laid before the meeting by Herr Heidenreich, the Secretary of the Association, and were approved.

Committees' Reports.

The reports of the Special Committees of the Association, which, with the exception of the Tubes or Pipes Committee, had been included in the annual report, were received and approved. Herr Hase, of Lubeck, the Chairman of the Tubes Committee, explained some points in the report, of which copies were before the meeting. He expressed the hope that the investigations on the use of cast and wrought iron or steel tubes, as well as the efforts which were being made to come to an understanding with the German Cast-Pipes Union, the Foundry Union, the Association of German Ironmasters, and the Association of German Engineers as to the lengths of cast-iron pipes and distinctive markings of different mains, &c., on plans, would later have satisfactory results.

Mr. Körting, of Berlin, then moved, on behalf of the Council, the election of President, other officers, and members of Council for the ensuing year. Herr Reese, not being eligible for re-election as President, is succeeded by Herr M. Hase, the Manager of the Gas, Electricity, and Water Works of the Corporation of Lubeck. Three vacancies on the Council were filled by the election of Herr Reese, of Dortmund, Herr Prenger, the Manager of the Gas, Water, and Electricity Works of the Corporation of Cologne, and Herr M. Sorge, formerly Manager of the Thorn Gas-Works. It was also decided to bestow the Bunsen-Pettenkofer Award of Honour on Dr. von Gruber, Professor at Munich, for his investigations on the Hygiene of Gas Lighting.

Employment of Prisoners of War.

Herr Lichtheim, of Altona, then opened a discussion on the "Extent and Results of the Employment of Prisoners of War on Gas-Works." Herr Martin, the Manager of the Erfurt Gas-Works, said that his experiences had on the whole been favourable, though the work done by the prisoners was considerably less than that of skilled men. About twenty prisoners performed work which otherwise would be done by fourteen men. The work done could, however, be considerably increased by supplementing the small wage paid, which, after all deductions, amounted to 62 pfennige (7½d.) per week. Herr Gadamer, the Assistant Manager of the Berlin Corporation Gas-Works, expressed himself in much the same sense as to his experiences with some Russian and French prisoners of war, as did also Herr Reese, of Dortmund, on their employment on day shifts, in which the work done had been considerably increased by paying wages agreed upon. Herr Bolstorf confirmed Herr Martin from his experiences at Essen. Herr Anklam, the Manager of the Water-Works at Friedrichshagen, had had unsatisfactory results from certain civilians detained at Rummelsburg.

Vote of Thanks.

The President announced that, having regard to the war, it appeared undesirable to fix upon a place for next year's meeting of the Association. Mr. Körting having proposed a vote of thanks to Herr Reese for his services during the three years in which he had occupied the presidential chair, the meeting ended about 11 a.m. The majority of those attending the meeting spent the evening together at the Zoological Gardens.

REPORT OF THE COUNCIL FOR THE YEAR 1914-15.

The following is a summary of the contents of the annual report of the Council, referred to in the foregoing notice.

Last year's meeting, held at Munich in connection with the German Gas Exhibition, was attended by many foreign gas engineers; but even while it was being held the shadow of the Sarajevo outrage fell on Europe, and a few weeks later war had broken out. Since then all the thoughts and power of the people have been directed to one object; and though the war is not over, its horrors have been kept out of Germany. As a consequence, there has been no serious interference with the supply of town and country with gas and water—the matter with which the Association is specially concerned. In the difficult conditions, which claimed all the strength of those of the Association's members who were not called to the colours, the special work of the Association has suffered; but, on the other hand, its members have been able to co-operate in measures for the benefit and defence of the country. The great importance of the gas industry and the allied coke industry in both war and peace has been clearly established. The scarcity of petroleum, which is almost entirely imported, has brought home to the mass of the populace and to the authorities with unprecedented force the great importance of gas. Numerous municipalities have taken steps to facilitate and extend the use of gas—such as abolishing all obsolete scales of charges, reducing prices, putting in prepayment meters and services free of charge or for small rentals, &c.—which will continue to bear rich fruit in times of peace. The war also has given an enhanced value to the bye-products. The supply of nitrate being cut off, ammonia has served to take its place for agricultural purposes, and thus ensured the food supply of the people. It has also become a new source for the manufacture of nitric acid, which is required for the production of both propulsive and bursting charges for the army. As regards tar products, benzol, toluol, &c., serve to replace imported petrol, and as raw materials for the manufacture of high explosives.

International Commissions.

Work of an international character, with which the Association has been connected in past years—such as the International Commission on Illumination, and the International Commission on Screw Threads—has been arrested. Other Commissions, dealing with matters not of a very pressing character, have ceased deliberations for the time being in order not to overtax members, who want all their strength for other work. But the Association have not altogether interrupted activities of this class; and the exceptional conditions now prevailing have raised a number of important and interesting questions which they will investigate in quieter times.

Hygienic Aspects of Gas Lighting.

The Munich Exhibition having directed attention to the importance of rectifying defects in apparatus which might favour the opposition of the ignorant (both authorities and individuals) to the more extended use of gas, the Association suggested that the Hygienic Institute of Munich University should undertake a scientific investigation of the hygienic aspects of gas lighting. This investigation has been carried out by Professor von Gruber, who has proved that the alteration of the air by gas lighting, even in small rooms with unfavourable conditions, can be quite disregarded from the hygienic point of view. These investigations, in conjunction with others made at the Instructional and Experimental Works on the gaseous products of gas heating-stoves, and at the Chemical-Technical Institute of the Carlsruhe Technical College on the products of combustion from gas-flames, afford a scientific basis for combating unreasoning prejudices against the use of gas. The Association will give the widest possible circulation to the results of the researches.

Rules in Regard to Gas-Heating Apparatus.

Some years ago, the Association issued printed rules for the proper construction, installation, and handling of gas-heating apparatus, which had been compiled by the Committee on Heating. These rules have been widely adopted and generally accepted; but the valuable knowledge acquired and advances made in the construction and in the duty of such apparatus in recent years rendered it desirable to make a thorough revision of the rules before issuing a further edition of them. At the request of the Council, Dr. Schilling submitted a scheme of revision, which was considered at a meeting held in Berlin on May 29, of the members of the former Committee on Heating and representatives of manufacturers of gas-heating apparatus. It was then decided that a thorough revision of the rules was necessary in order to bring them up to date and to avoid misunderstandings and overcome difficulties which militated against the employment of gas-stoves. These difficulties frequently arose from antiquated regulations of local or state authorities on the disposal of the products of combustion. In this connection the Association successfully petitioned the Government of one German state to cease to apply to gas-stoves regulations which had been issued in 1882, and were clearly intended only to apply to stoves using solid fuel. This is not a unique case; and the Association are endeavouring by explanations to secure the removal of such difficulties in the way of the use of gas.

Standard Lengths of Pipes.

The Special Committee on Pipe Questions last year prepared a detailed circular of inquiry with a view to collecting information on the use of cast and wrought iron or steel pipes and the experiences gained with them; and the circular-letter had been sent this spring to all the gas and water works represented in the Association. By the 1st of June last, 180 answers (some very full) had been received. They contain much valuable information, for which best thanks are given to those who have furnished it in such busy times. Messrs. Hase and Wahl have been entrusted with the task of collating the information for report. The question of the distribution of gas under high-pressure having been raised afresh, Herr Eisele has undertaken to prepare a scheme for its investigation. The Committee has also had under consideration a communication from the Prussian Ministry of Public Works forwarding a petition from the Cast Pipe Makers' Union asking for an extension of the standard lengths of cast-iron pipes which had been settled by the Association and the Association of German Engineers. There being a consensus of opinion against the extension, the two Associations replied that the standards already settled by them ought to be adhered to. The Union persisting in its appeal, however, a conference was arranged between the bodies concerned, which took place at the Prussian Ministry on Jan. 6 last; but no agreement was arrived at, as the Pipe Makers' Union wished to accept the standard lengths merely as minimum lengths which could be exceeded at their discretion. On March 22 the Committee, with the approval of the Council of the Association, decided to adhere to the definite standard lengths, and anticipates that the German Association of Engineers, to which it has recently communicated this decision, will give its adhesion to this attitude.

Electrolysis.

The question of the connection of lightning conductors to gas and water mains has been raised afresh, and the Council has collected in the course of the year a lot of data thereon with a view to further consideration of the matter, which Dr. Scheelhase and Herr Terhaerst have undertaken to go into as soon as times are quieter. Another question which has been kept in abeyance is that of the protection of gas and water mains from vagrant electric currents. The rules agreed upon by a Joint Committee on Electrolysis have not been generally followed, because they lacked legislative force, and the Association therefore petitioned the Minister of Public Works to alter the regulations for the construction and operation of tramways in the sense of these rules. No decision has yet been given by him—not a matter for surprise in present circumstances. Meantime, as the stock of copies of the Rules has been almost exhausted, the Council has ordered a further supply, which it will distribute freely.

Water Supply of German Towns.

Data collected by the General Secretary as to the chemical quality of the water supply of German towns of over 10,000 inhabitants have been printed as an appendix to the report of the Water-Works Committee, and will be published shortly. Much trouble in assembling these data was, however, caused through want of uniformity in the methods of analysis and way of stating results, and the Association is taking further steps with a view to securing uniformity in these respects by all water analysts.

Instructional and Experimental Works.

The Instructional and Experimental Works of the Association, at Carlsruhe, having in the previous year foreshadowed special development of its work in the direction of the investigation of all classes of apparatus for the consumption of gas, it was decided to put in hand an extension of the works to provide accommodation for these investigations. The carcase of the new building had been all but finished when war broke out, and the Superintendent (Dr. K. Bunte) and the whole staff of the works were called to the colours. Building operations were continued only so far as was necessary to keep out wind and weather. Experimental work in progress was transferred to Dr. Terres, working under Professor H. Bunte at the Chemical Technical Institute. Through the latter, also, many technical questions from members of the Association were answered, and this branch of operations of the Experimental Works was thus kept active. In connection with the gas exhibition, a conference of gas chemists was held at Munich on the 6th and 8th of July last year, which was attended by 46 chemists, who discussed a number of questions which had been prepared for the conference by the experimental works. It was decided to arrange for similar conferences in future years. Herr Reichard has continued to look after the finances of the works; and his services in this direction, especially in regard to the extensions, have been greatly appreciated.

"Award of Honour."

In accordance with the decision of last year's meeting at Munich, the Bunsen-Pettenkofer "Award of Honour" was conferred upon Dr. W. von Oechelhaeuser and Herr Ries for their notable services to the gas industry and to the Association.

Gas and Water Statistics.

The thirty-fifth volume of gas statistics relating to the year 1913 (or 1913-14) contains particulars of 394 undertakings, compared with 441 in the preceding volume—a diminution due to the inability of some works to furnish information owing to the depletion of their staffs through the war. The omissions are chiefly small or medium-sized works, with some of the foreign works (Riga and Helsingfors) hitherto included in the statistics and works in districts occupied or threatened by hostile forces (Lyck, Marggrabowa, Eylan, Ratebor). On the other hand, six works appear in the statistics for the first time. Forty-four works out of the 394 reported a falling off in gas consumption—due to a decrease in use for lighting which in these cases was not offset by increased use for other purposes.

Questions for the twenty-fifth compilation of water supply statistics were sent out on Nov. 5 last to 478 works; and replies have been received from 378, as compared with 415 works which supplied information for the last volume.

Membership Roll.

The deaths of nine members have been made known since the last report was issued. The war has so far claimed no victims from the ranks of individual members; but there have been losses among the representatives of corporate members (municipalities, companies, &c.). The total membership shows an increase of five. At the end of the year it was made up of five honorary members, 885 members (439 personal, 446 corporate), and 189 associates (makers of apparatus, &c.). A list of subscribers to the scientific purposes fund of the Association is given. [It includes the "Gas Company" at Berlin, evidently meaning the local administration of the works of the Imperial Continental Gas Association there, though the Association's name is given when the contribution from its Hanover works is recorded.] It has been decided to make no election on the Schiele Foundation, but to allow the funds to accumulate.

District Associations.

There are eight district Associations affiliated to the German Association.

1.—The Brandenburg Association of Gas, Electricity, and Water Engineers finished the year with a total membership of 188—a decrease of five. They held their annual meeting on March 20 to 22 last, in Berlin, under the chairmanship of Herr Kümmel, of Charlottenburg. The programme of this meeting was given in the "Journal" for March 30 last (p. 789).

2.—The Mid-Rhenish Association of Gas and Water Engineers on Oct. 1 had 270 members of all classes, as against 272 twelve months previously. It was decided not to hold the fifty-first general meeting, which, before the outbreak of war, had been fixed for Sept. 17 and 18 last at Neustadt in the Harz Mountains. The Association have contributed £150 to the Red Cross funds. The Chairman is Herr F. Göhrum, the Manager of the Stuttgart Gas-Works.

3.—The Association of Gas and Water Engineers of Silesia and Lusatia should have held their forty-sixth annual meeting at Reichenberg, in Bohemia, on Aug. 12 to 14 last; but on the outbreak of war all the preparations for it were cancelled. It is not contemplated holding a meeting until the war is over, when the first gathering will be at Reichenberg.

4.—The Association of Gas, Electricity, and Water Engineers of the Rhine Province and Westphalia had on April 1 last 383 members of all classes. The customary autumn meeting was given up; but a special war-time meeting was held at Cologne on Feb. 13, at which Herr O. Meyer, the Manager of the Dortmund Gas-Works, was elected Chairman for the ensuing year. Herr Ohly, the Manager of the Commercial Association of German Gas-Works, gave an address on the "Industrial Difficulties Created by the War." It was decided to start a fund for the relief of members and their dependents in necessity owing to the war, and a contribution of £500 from the Association was voted to the fund.

5.—The Bavarian Association of Gas and Water Engineers decided not to hold a general meeting as in previous years.

6.—The Baltic Association of Gas and Water Engineers decided to hold their forty-second annual meeting at Munich shortly before the general meeting of the parent Association in July last year. Herr Handke, the Manager of the Stolp Gas-Works, was elected Chairman in succession to Herr M. Sorge, the Manager of the Thorn Gas-Works. It was decided to hold the next meeting at Allenstein.

7.—The Association of Gas and Water Engineers of Saxony and Thuringia held their sixty-second general meeting at Leipsig on May 8 last. Herr Schäl, the Manager of the gas and water works at Aschersleben, was elected as Chairman in succession to Herr Jäckel, the Manager of the Plauen Gas-Works. Two addresses were delivered—one by Herr Lempelius, the Manager of the Central Gas Publicity Organization, on "Experiences in Working Gas-Works in War-Time," and the other by Herr Ohly, on "Industrial Difficulties Created by the War." These addresses gave rise to a lively discussion, to which twelve of the members contributed, and a debate ensued on the lighting of barracks and railway stations and the use of coal gas by the State Railways for lighting passenger coaches.

8.—The Association of Gas and Water Engineers of Lower Saxony gave up their sixteenth annual meeting, which should have been held at Altona on Sept. 10 to 12 last. There has been no alteration of membership during the year, and the former officers and Council have provisionally retained office. The Association have contributed £50 to the Benevolent Fund of the German Association of Gas and Water Engineers, to be applied only to the relief of members who may be in necessity owing to the war.

DUTCH GAS MANAGERS ASSOCIATION.

Annual Meeting.

[From a Dutch Correspondent.]

The Forty-Third Annual General Meeting of the Dutch Gas Association was held at Nimeguen on the 7th and 8th inst.—Heer J. E. H. Bakhuis, of the Hague Gas-Works (the President), in the chair.

On the evening of the day preceding the meeting, the Lord Mayor received the members at the Town Hall, and in welcoming them pointed out that, though it was no time for festivities, he heartily approved of the meeting taking place. In these periods of stress, conferences and deliberations were necessary to meet the difficulties which cropped up in all directions. More especially gas managers had to struggle against grave troubles connected with the supply of coal—the disposal of the bye-products giving rise also to anxiety. It was with great regret that managers were obliged to look on their rapidly disappearing profits. But all of them should persevere; and if difficulties were met with energy, it would be possible to look back, when more peaceful times returned, on this period as one in which men had shown themselves at their best. The President thanked the Lord Mayor for his remarks.

The following day, the meeting of the Association was opened with

An Address by the President.

The President, addressing the members, mentioned the numerous difficulties that have confronted the gas industry owing to the war—more especially the supply of coal and the disposal of bye-products. Nevertheless, he said, the greater number of the gas-works passed the winter tolerably well; and when, in the weeks between winter and spring, the time of greatest shortage arrived, the Royal Auxiliary Committee and the Industrial Committee were in a position to give help. From this combination there resulted the Bureau of Coals, which had proved to be a great boon, more particularly to the small works. The readiness with which the coal merchants had joined the Bureau might be regarded as a deed of great patriotism.

Proceeding, the President referred in greater detail to the tremendous difficulties which had to be overcome. They ought, he pointed out, to be prepared for eventualities; and when it was not possible to get an adequate supply of proper gas coals, they must take what coal they could obtain—even the small coal from their own mines, mixed with bituminous coal. In all cases they must be prepared to modify their views with regard to quality, and to keep an open mind on the subject of gas prices. But they might certainly ask themselves what the future would bring. A decrease in the number of difficulties was not to be expected so long as the war might last. On the contrary, gas engineers had to prepare themselves for the most unexpected events.

It was probable that the war would have a stimulating effect on the future of the gas industry. With the belligerent countries, it had been shown how manifold were the interests served by gas. Take, for instance, Germany, where the industry had been able profitably to replace the shortage in oil by the greater use of gas. In their own country the consumption of gas had not profited; but, on the other hand, the use of coke had been increased by the shortage of anthracite—coke having thus become very much more popular in the past winter. He did not wish it to be understood that the consumption of gas had been seriously influenced by the war, because there were many towns where the demand had increased, in spite of serious times.

Though coal prices were high, prices of bye-products had risen too. Tar was on the up-grade; and ammonia had proved to be a residual of high value now that there was not a full supply of nitrate of soda. Sulphate of ammonia, too, would no doubt be used to a greater extent in agriculture than it was before the war. Nevertheless, coke should be regarded as the principal bye product; and it might be anticipated that next winter would find them without any stocks of this. However, the high coal prices had undoubtedly spoiled much of their effort—many towns having been obliged to raise the price of gas. This naturally interfered with the economical conditions of gas as compared with electricity, for the electric works were not suffering to such an extent from expensive fuel.

In concluding his speech (which was cordially applauded), the President emphasized the fact that the position of the industry is still very strong, and that although the horizon might not be absolutely unclouded, it is still clear enough. Every possible care must, he said, be taken to ensure the growth of the gas industry, and they would all hope that in this fight sight would not be lost of the ultimate goal of low gas prices.

Membership Roll.

Heer N. W. van Doesburgh, the Manager of the Leyden Gas-Works, having been unanimously elected an honorary member in recognition of his services as Hon. Secretary of the Association, and in connection with the Association's official paper "Het Gas," it was reported that there were seven honorary members of the Association, 335 ordinary, and 136 associates or extraordinary members. Subsequently the President stated that the Dutch Association had agreed with the French Association to act as intermediaries between the French gas-workers that are prisoners of war in Germany and their relatives in France—a suggestion which was cordially applauded.

Spent Oxide.

After this, a communication by Dr. van Oostrom Meyes, on "Spent Oxides," claimed attention.

The author began by pointing out that he was stating no new facts. The first point he intended to mention was that of the inactivity of oxide—why the purifying mass so slowly absorbed the sulphuretted hydrogen. The working agent in the purifying mass was the hydrate of iron—that was to say, generally only this form of iron salt was regarded as the active portion, and the oxide form was considered to be of little use. In order to secure some data on this question, he made various experiments.

He took a quantity of purifying material, air dried, and placed it in a glass tube in the usual manner; care being taken that the moisture formed during the reactions could not escape, but was taken up by some absorbent. After weighing, a stream of sulphuretted hydrogen was passed through the tube until the oxide was saturated with it. After this, the weight of the tube was ascertained, and it was found that the purifying mass had absorbed 16·2 per cent. of sulphuretted hydrogen. A second experiment was conducted with oxide which had been dried over a period of 24 hours, at 150° Celsius. In this case the absorption, calculated on the original wet mass, was 16·4 per cent. Subsequently another portion of the dried oxide was placed in a tube, and air with ammonia gas passed through it. After this treatment, the stream of air and ammonia was replaced by a stream of sulphuretted hydrogen, until the mass was saturated. The amount of sulphuretted hydrogen taken up was 18·7 per cent.

A further experiment was conducted with the original mass after it had been burnt slightly for sixteen hours; and after saturation with sulphuretted hydrogen, the result was an absorption of 20·5 per cent. This showed that oxide of iron took up sulphuretted hydrogen as well as did hydrate of iron, and also that by burning the oxide slightly its absorbent power had increased about 20 per cent. This did not prove that it was desirable to burn all purifying material before its use, for in this event the results would certainly be not at all striking. It merely meant that it was not the amounts of hydrate of iron and of oxide of iron that regulated the activity of purifying materials. When masses were not sufficiently active, one ought to seek the remedy in another direction.

There was yet a further question relative to the inactivity of purifying materials, and this was the real or supposed presence of acids. In order to gauge the influence of these, the author treated iron ore with dilute hydrochloric acid, washed out, dried, and subsequently saturated with sulphuretted hydrogen. The result was that the oxide took up 16·7 per cent. of sulphuretted hydrogen—a trifle more than was the case with the original mass. A similar experiment was made after the oxide had been exposed to a current of air saturated with acetic acid, when 17·8 per cent. of sulphuretted hydrogen was absorbed. One of the last experiments was made with bog ore, after it had been treated for an hour with carbon dioxide. In this case, the absorption was found to be 23·2 per cent. of sulphuretted hydrogen. The investigations indicated that, generally speaking, acids had no deleterious influence on the activity of purifying materials.

It became necessary, therefore, to pursue the inquiry in another direction, for most probably it was not the admixtures in the ore, but the form of combination of the iron salt, that regulated the activity of the purifying material. There were, he pointed out, several means at one's disposal to increase the activity of purifying material—the addition of ammonia by the temporary shutting-off of the wet purification, and solutions of sodium carbonate, copper sulphate, and copperas. Compared with natural bog ore, artificial purifying materials consisted chiefly of ferric hydrate chemically produced. In this material, the iron salt was able to take up sulphuretted hydrogen with great avidity; and this causes the high intensity of its action.

Often a mass of purifying material with 17 to 20 per cent. of sulphur showed no more inclination to absorb sulphuretted hydrogen, though it had only reached its point of saturation when the amount of sulphur has risen to about 45 to 55 per cent. This might be due to the circumstance that the ore is too coarse of grain. If so, the mass might be made thoroughly wet, so as to soften it, and afterwards treated with a weak soda or ammonia solution. But the defective absorbent power might also be due to faults in the wet purification. Though a temporary shutting-off of wet purification was favourable to induce action with inactive purifying masses, the permanent addition of greater quantities of ammonia gas to the oxide was deleterious to the working of the dry purification. Defective wet purification might totally ruin a purifying oxide, and render it unsaleable.

The second point dealt with in the paper was the spontaneous combustion of spent oxide, and the measures which ought to be taken to prevent this. With the spent oxide freshly taken from the boxes, there was iron and sulphur on one side, and oxygen in the air on the other. They next had oxygen and iron combined, and free sulphur. It was the setting free of large numbers of heat units, together with the extremely finely divided state of the free sulphur, which caused the rise in temperature up to the burning-point of the sulphur. It was therefore only necessary to take measures to deal with this increased temperature, and when the chemical action was over, the oxide would have lost all danger.

In gas-works practice, there was in connection with dry purification, the point of cost. A great part of the purification costs was counterbalanced by the returns for the spent oxide; and the question was how to get the most for the spent material. Suppose the proportion between sulphur and prussian blue in the spent mass was normal, they had for the prices of blue in ordinary times the following figures. Taking the price of the spent oxide with 6 per cent. blue at 100 per cent., then 7 per cent. blue was paid with 140 per cent.; 8 per cent. blue with 195 per cent.; 9 per cent. blue with 260 per cent.; and 10 per cent. blue, with 345 per cent. When, therefore, they raised the amount of blue from 6 to 7 per cent.—an increase of 16 to 17 per cent.—the market value rose more than 25 per cent.; and if they were in a position to raise the amount of blue from 9 to 10 per cent.—only an increase of 11 per cent.—the market value went up 33 per cent. Of course, this was very natural; for when in the chemical-works the losses in the extraction of the blue were the same in weight for various masses, the loss on percentage was much larger with the inferior masses than with the oxides of high blue contents. Therefore, one ought not to be afraid in gas-works practice of using the oxide one turn more, so long as it showed some increase in temperature during regeneration; for the slightest increase in the percentage of blue richly repaid the labour costs.

In conclusion, the author reviewed the various methods of analyzing spent oxide—more especially the popular Knublauch plan and the somewhat modern Feld method. The Feld system, he said, gave figures that were about 1 per cent. in amount of blue higher than the Knublauch method.

The paper gave rise to an animated discussion.

Another contribution, dealing with "Oven Systems," by Herr H. Koppers, of Essen, was not given, owing to the war. After lunch, the question-box was opened.

THE QUESTION-BOX.

The first question was: "Are there gas-works that have used blast-furnace coke for furnace-firing or boiler-firing; and what are the financial results?" There were, it appeared, gas-works which had used blast-furnace coke, because it had been offered from Germany at low prices; but no substantial economy had resulted. There was one important point in favour of the use of furnace coke—that it caused a greater amount of gas coke to be available for retail sale.

The second question was whether any members had practised the introduction of steam into horizontal retorts during the last hour and a half of carbonization. The general opinion was that this increased the gas production, but lowered the candle power of the gas. Figures as to gas production and lighting power were not given.

GAS FROM PEAT AND WOOD.

The third question related to experiments in making gas from other materials than coal, and more especially from peat. As in the coming season a shortage of coal is to be feared, no means ought to be left untried to make gas from other material.

The first member to give his experience was the manager of the Sappemeer (Groningen) Gas-Works, almost in the centre of the peat districts. His first trials were with peat only; and these were a failure. He obtained, indeed, a satisfactory bulk of gas; but it had an insufficient candle power, and the calorific value was such that it could not be used in gas-cookers. The second series of experiments was with a mixture of coal and peat; and ultimately it was found that the best results were obtained when a mixture of 75 per cent. of coal and 25 per cent. lumps of peat was used in the retorts. Trials were also made with the use of a higher percentage of peat, in which case the peat was previously tarred. The gas was fairly good; but the retorts showed considerable incrustation.

The gas manager at Bedum (a small borough in the same district) had tried wood for the production of gas. The most favourable results had been secured when using four parts of gas coals and one part of pine wood. The gas was of good quality, and caused no complaints. He also tried peat for gas production, but was of opinion, too, that a mixture of coal and peat was really best for carbonization. Further, he had produced gas from old railway sleepers, getting good results; but when his stock was exhausted, he could not get any more.

Other experiments had been made with peat lumps soaked in kerosene, and afterwards watered to prevent flaming during retort charging. This mixture gave a gas of good quality, but of very low specific gravity. On an emergency, retorts had been filled with a mixture of peat and wood; and none of the consumers complained of the quality. All these experiments had been conducted in small works, where there were no adequate means of testing the gas, so that the conclusions were somewhat at random. But as the question is of very general importance—Holland having lots of peat—it has been resolved that experiments should be carried out in larger gas-works, with adequate experimental plant. For this purpose, peat is to be carbonized at The Hague Gas-Works in horizontal retorts, and at Amsterdam Zuider Gas-Works in vertical retorts.

MISCELLANEOUS MATTERS.

Subsequently, the members resolved to prepare instructions for the piping of houses and the installation of gas appliances; a committee being appointed to draw them up.

On the following day, there was an animated discussion on the advisability of increasing gas prices under the present abnormal conditions. In this connection, it may be pointed out that Dutch gas-works are for the most part municipally owned, and that in normal times profits go to the relief of the rates. The advisability was pointed out of putting by reserve funds in good years to meet losses in bad times; and one speaker urged that, rather than increase the price of gas, it would be preferable to raise a loan to cover losses in this period, with the intention of paying the loan off out of profits on the return of normal times. The general opinion seemed to be that reserve funds for paying losses in bad years were necessary for all gas-works, but that in the present circumstances it was not advisable to raise a loan to keep the price of gas at a low level. It would be better to raise the price—more particularly as it was quite impossible to tell how long the war would last.

The next point discussed was whether it was advisable to promote the sales of gas by official advertisements, &c., issued by the Association. It was agreed that the promotion of gas sales was more especially a matter for each separate town, but that the Association could lay down general rules and instructions. The President recommended the formation of a new organization on the basis of the British Commercial Gas Association, and the German Gas Promotion Centre. A committee was appointed to go into the matter.

A communication by Heer Brender à Brandis, of The Hague Gas-Works, discussed whether the latest artificial fertilizers were able to damage the sale of sulphate of ammonia. The author gave a review of the various sorts of nitrogenous fertilizers that have come into the market the last few years. His opinion was that synthetic ammonia is the most to be feared.

At the end of the discussion, Heer van Rossum du Chattel, the General Manager of the Amsterdam Gas-Works, made some remarks concerning the Dutch Coal Reserves Company. As an article on this question has already appeared in the "JOURNAL" [*ante*, p. 71] it is unnecessary to deal further with the subject here.

The President for next year is Heer van Niftrih, Director of the Imperial Continental Gas Association's works at Flushing. The meeting will be held in Amsterdam.

THE ECONOMIC UTILIZATION OF COAL.

Some Methods of Production of Cheap Power.

Mr. Walter F. Reid, a Past-President of the Society of Chemical Industry, in the course of a paper, entitled "Economic Utilization of Coal and the Production of Cheap Power," read the week before last at the annual meeting in Manchester, said that in the past they had drawn most lavishly upon their supplies of this important raw material—not only using it wastefully ourselves, but also exporting large quantities even to our keenest trade rivals. Voices had been raised in warning against too lavish a use of their valuable resources. A Royal Commission, after a long and thorough investigation, had come to the conclusion that our stores of mineral fuel would suffice for many generations to come. As to the increased cost of coal to manufacturers, part of the increase was doubtless due to the increased depth of mines and to the increasing cost of labour, in addition to Government restrictions and regulations which had been enforced. Many countries abroad possessed coal resources that had scarcely been touched; and they also possessed more abundant resources than ourselves. The stores of fuel available for mankind were enormous; and if they were uniformly distributed no nation would have any cause for anxiety. Recent events, had, however, shown that no nation could with safety depend upon its neighbours for the supply of any raw material. The total coal output in the whole world during 1913 was 1,363,878,110 tons. In 1909, it was 1,093,663,143 tons, which showed an increase during this period of about 25 per cent. Taking these figures as a basis, and assuming that Germany controlled one-half the coal output of France, as well as that of Belgium, then the coal output at the disposal of the Central Empires was 366,564,447, compared with 411,238,173 tons available for ourselves and our Allies. For the production of power alone the supply was ample; for in 1905 Dr. Beilby estimated the consumption for this purpose at 52 million tons. More than one-half of the coal used for the production of steam power was wasted. Even if they adopted the most economical steam plant available, this method of producing power was still wasteful compared with other methods of utilizing fuel that are now in practical use. Some ten years ago Dr. Beilby estimated that the 52 million tons used for power could be reduced to 11 millions by using gas. It would scarcely be disputed that the gas-engine was theoretically a more efficient means of producing power from coal than the steam-engine; but difficulties in the case of large installations had limited the application of this power to smaller units. For large power stations, the steam-turbine still maintained its position, and had done much to check waste in fuel, so far as steam power was concerned.

Gas Power the Cheapest Form of Energy.

In the light of modern technical progress, he considered it did not appear necessary that the coal should be mined and brought to the surface at great expense. An enormous saving could be effected by extracting the coal from the face of the seam by mechanical means and converting it into gas in the mine. Power could be produced from the gas on the spot, and transmitted to any required distance by electricity. The electric current produced in this way might well compete with that derived from water power in a distant country. Even with coal mined in the usual way, gas power appeared to be the cheapest form of energy generally available in England. The value of the bye-products, and the inferior quality of the coal that could be used, did much to diminish the actual cost of the power.

Power from Peat and Waste Products.

Gas produced from other materials than coal had been successfully used as a source of power. Peat had completely supplanted coal for the last four years at an important factory at Portadown (Ireland), with a saving in cost of more than 50 per cent. Many plants for producing power from waste wood and other waste products had been erected and worked with profit to the manufacturers concerned, but these materials were not available in such quantities as to provide a general source of cheap power. However cheap the materials might be at the moment, when a demand for them arose the price increased. For this reason he did not include oil among cheap sources of power.

The Gas-Turbine.

Hitherto he had spoken of gas-engines of the reciprocating type; but the gas-turbine had now arrived and had come to stay. The difficulties arising from the action of the high temperature on the turbine blades were being surmounted.

Natural gas as a source of power possessed great importance in some countries; but the small occurrence of this useful product in England precluded its use on a commercial scale.

A Tribute to Mr. Carpenter.

The President-Elect of the Society (Mr. Charles Carpenter, D.Sc.) had introduced a method for eliminating almost the last traces of sulphur from gas distributed in our towns. The great reproach to the use of gas in cities was that the sulphur was still in the atmosphere. The chemist knew full well that the sulphur was more injurious than the soot; so that, as the result of Mr. Carpenter's discovery, they might possibly get pure air now. He hoped that the day was not far distant when, instead of destroying the coal by one operation, they would arrive at a means of separating the constituents before the coal was wholly destroyed. He himself had made many experiments with a view to this end.

DISCUSSION.

Professor William A. Bone said there was no doubt about the importance of the subject they were discussing, and he was glad it had been brought forward at the meeting, because they had heard so much about the national importance of coal-tar dyes. The question as to the economy that could be effected, for instance, in power production was perhaps at the moment primarily of the greatest importance; and he would like to put forward a suggestion to chemical manufacturers as to the advisability in all large factories (it would not be practicable, perhaps, in the small ones) of establishing a department for fuel control, quite apart from the ordinary chemical laboratory. In all cases where the scheme had been adopted, and economically carried out, the saving effected had been out of all proportion to the cost of the fuel controlled. For example: In a firm with which he had been connected for many years, where iron and steel were manufactured, they had, during the last five or six years, by the establishment of a very rigid fuel control—and they paid their specialist one of the highest of salaries—been able to smelt the iron from the ore, convert the pig into steel, finish the rolling of the steel, and turn it out in the form of girders or rails, using no more coal than they used through the coke-ovens for blast-furnaces. Of course, this was only possible in an iron and steel works where the fuel arrangements were under proper control. He was not very much in favour of Government intervention, or aid, as it was sometimes euphemistically called in connection with industry; but he thought attention might be drawn to the very valuable reports which were being issued from time to time by the United States Government Bureau in Washington with regard to a survey the Bureau were making as to American coals, and also with reference to the utilization of coal for different purposes. He thought a survey of British coals, from a chemical point of view, was a great necessity. Some people talked about coal as though every seam of coal was composed of a substance that was perfectly uniform. "Coal" was simply a wide name for a whole series of varieties. It would be very useful if the Society of Chemical Industry instigated some sort of systematic inquiry—an inquiry which might well be done through existing institutions and laboratories, each working in its own area, and supplying interesting information about coal in the particular neighbourhood.

Professor H. Louis (Newcastle-upon-Tyne) said coal was used for three purposes: (*a*) for generating power, (*b*) for heating, apart from power, and for (*c*) metallurgical and allied industries. He gathered from Mr. Reid's paper that his main thesis was that the gas-engine would replace the steam-engine. Personally, he had his doubts. He was inclined to think that for large industries, where great quantities of power were required, it was as cheap to generate electricity by steam as by gas, and for small industries he had no doubt that the development of large central power supplies would answer their difficulty to a very great extent. He believed that on the whole of the shipyards on the Tyne steam power had been replaced by electric power. The question of the use of gas *versus* steam was a very debatable point. He knew the danger of prophesying, but he thought the steam-engine would hold its own for many years to come. He thoroughly agreed with Mr. Reid that there was a great advantage when gas was made from inferior coal slack and various things of this kind; but unfortunately our collieries were not in a position to produce nothing but slack to-day. He considered that it was very wasteful to use our best coal for gas generation. There were certain qualities of coal which were best used for making gas, and there were other qualities which were better for burning in boilers. If they were to have real economy they must effect some improvement in both methods, for both systems went practically hand-in-hand nowadays. One could not supplement the other at all. With regard to Mr. Reid's observations on "power being produced from gas on the spot," the law to-day would not allow a gas-producer underground—in a mine. He wanted at one time to put a suction plant underground, but found it was entirely against the coal-mining regulations. With a gas-producer underground there was the risk of danger of carbonic oxide getting into the workings. Those who had had experience of the cost of working plant underground knew that it was very much more than on the surface. Plant could not be worked underground as economically as on the surface—it could not be given the fullest supervision.

The Sulphur Question.

Mr. Charles Carpenter, D.Sc., thought that the meeting was greatly indebted to two gentlemen for the interesting information which had been placed before them that morning—namely, Mr. Walter Reid for his very able paper, and Professor Henry Louis, whose remarks formed a most important addendum to it. It had long seemed to him that the State should take some part in the control of the important industry of coal mining, not only from the point of view of labour, but the disposal of what was, after all, the important part of the capital assets of the country. Professor Louis had given an example of how this might be wasted in the mines, and he (Mr. Carpenter) would like to point out that while we had to maintain an enormous Navy for the purpose of, among other things, protecting these coal resources, our enemies paid nothing by way of contributing to the cost. He had been told by those who ought to know—for they were associated with the production and sale of coal abroad—that there was no reason whatever why an export duty should not be placed upon coal. The price already being paid was more than the normal price of coal, even if a shilling or two duty were added, and, of course, had to be given, because it was indispensable. More especially was this true of certain kinds of English coal, such as the coking or smokeless varieties. He had been assured that the main objection to the levying of a duty on coal was lest it should be a fluctuating one, but that if a standard duty were fixed, to which buyers and sellers became accustomed year by year, the amount added by way of duty would be paid as a matter of course. Mr. Reid had referred to the work in which he (Mr. Carpenter) had been interested—the matter of reducing the sulphur compounds in gas; and it might be interesting to the meeting to know that they were now experimenting with the use of coal so impure that it ought not to be used for either gas making or burning in furnaces, although in the former case they had not such a special means of dealing with the sulphur as was now available. The inferior coal to which he had referred was being used, not with the object of producing gas, which was regarded as a bye-product, but in order to obtain sulphur for sulphuric acid making, for which, as everybody in the room was aware, there was a present great demand. He thought that if the uses of gas for industrial purposes were more widely known, its application would be very greatly extended, and mentioned the case of the heating of pots for chemical fusions, which required a minimum amount of supervision and control in the great regularity in heat provided by the combustion of gas.

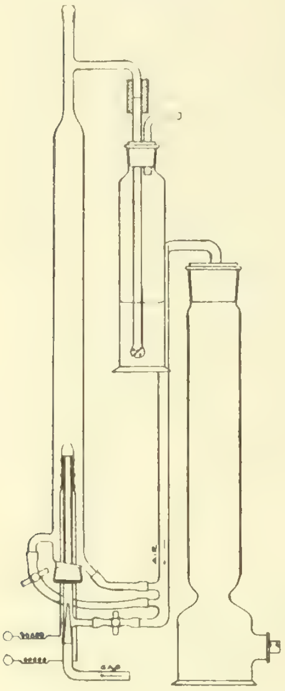
The Author's Thanks.

Mr. Reid, in thanking the members for their patience in hearing him, referred to the low-temperature distillation of coal. The products arising therefrom were exceedingly valuable. He hoped that in future they would not distil coal at all, but would find some other way of utilizing the product more economically. He agreed with Professor Louis that the use of steam for large installations was to be preferred—he said so in his paper—but from a theoretical point of view, there must always be a waste of a certain amount of heat, because the coal had to be converted into steam. Mr. Carpenter's remarks as to the new sources of sulphur in this country were most interesting. He had illustrated the excellent work done in extracting the sulphur from the coal gas that we were now using.

DETERMINATION OF SULPHUR IN GAS.

The United States Bureau of Standards (Washington, D.C.) has issued a "Bulletin" by Messrs. E. R. Weaver and J. D. Edwards, entitled "Apparatus for the Determination of Sulphur in Gas;" and the text of it appears in the current number of the "Journal of Industrial and Engineering Chemistry."

The authors write: The sulphur apparatus which is shown in the accompanying illustration is the same in principle as the well-known Drehschmidt apparatus and its many modifications; the gas being burned and the oxides of sulphur collected by passing the products of combustion through an alkaline absorbing solution. The novel features of the apparatus, as illustrated, are the burner and the combustion chamber.



The burner is similar to one described in a technological paper of the Bureau.* The method of igniting the gas and the arrangement of secondary air inlets, however, are different. The platinum spiral which was heated to incandescence in order to ignite the gas has been replaced in the new type of burner by a pair of platinum terminals forming a spark gap. The inconvenience caused by the occasional burning-out of the platinum wire is in this way avoided. The platinum terminals are sealed to the porcelain burner tube by means of "sealing-in" glass. Only a short length of platinum wire is necessary—nickel leads being soldered to the platinum terminals, just below the point where the latter are sealed to the porcelain tube. The stopper which closes the lower end of the combustion chamber also serves as a connector; the porcelain burner tube and the glass T-piece being firmly fastened into it by means of Khotinsky or sealing wax. The small tip through which the gas enters, just above the primary air inlet, is also held in with Khotinsky cement. The tip can be easily removed for cleaning, or tips of various sizes (adapted to the gas to be burned) can be inserted. The air necessary for complete combustion, after being purified by passing through the large soda lime tower, is supplied to the flame in two portions. The primary air is drawn in by the gas as it passes through the small tip, the secondary air enters through the two inlets at the side of the combustion chamber.

The combustion chamber, made of Jena glass tubing, is about 360 mm. long and about 25 mm. in internal diameter. The narrow tube at the top may be used for introducing water when it is desired to rinse out the apparatus; when in operation the tube is closed with a small cork. Satisfactory drainage is provided by the sloping layer of paraffin or sealing wax covering the stopper at the bottom. When the burner is lighted, the secondary inlet air keeps the base of the apparatus cool; but the rest of the combustion chamber up to the side tube is heated so that no condensation takes place on the walls. For this reason it is usually unnecessary to rinse out the combustion chamber. By means of a cork connector, the first of a series of wash-bottles is attached to the apparatus. Only one wash-bottle is shown in the illustration; but three are usually required for satisfactory operation. In order that the suction may pull the gas steadily through the wash-bottles, it is necessary that the end of the inlet tube of the first bottle be perforated with a number of small holes. With a single, large opening the operation of the burner is not steady.

Experience has shown that combustion of the sulphur to oxides is incomplete when the flame (because of too little primary air) is smoky or even strongly luminous without smoke, as well as when the supply of secondary air is not sufficient. This latter condition is shown by a flame with an indefinite or "ragged" outline. When the gas and air entering the burner are so regulated that the flame is non-luminous and clear-cut, combustion is complete, and the results obtained have been more concordant than those obtained with any other apparatus in use in this laboratory.

The advantages of the apparatus are its small cost, simplicity of construction, and the fact that the difficulty of lighting and regulating the burner usually experienced in the use of apparatus of this type is entirely overcome. The platinum wires become heated by the gas-flame and prevent the flame going out when the pressure fluctuates. With a single adjustment, it has been found possible to keep the flame burning with gases varying in composition from pure hydrogen to pure acetylene, and at pressures ranging from 2 to 10 inches of water. Of course, combustion was not complete with such extreme variations. It is, however, easy to adjust the apparatus to burn completely any gas which can be burned in any bunsen-type burner.

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* "Determination of Sulphur in Illuminating Gas," by M'Bride and Weaver. See "JOURNAL," May 20 and 27, 1913, pp. 531, 598.

COMPOSITION OF GAS IN RELATION TO THE PERFORMANCE OF THE BUNSEN BURNER.

In giving, *in extenso*, an article by Mr. Robert F. Pierce, some extracts from which we publish below, the "American Gas Light Journal" remarked: "Very often the value of certain research work is not thoroughly appreciated until some other line of examination calls it to mind. The article by Mr. Pierce, in which he describes the results of some experiments on the performance of the bunsen burner with gases of differing calorific values, gives a different aspect to a good many things we were just beginning to accept as standard. It emphasizes particularly the value of flame temperature in gas utilization, and shows, more forcibly than most others have done, that this characteristic is not always affected by an increase in B.Th.U. value—the change being, of course, due to other constituents of the gas. Mr. Pierce's conclusion is a little startling when he says: 'As far as incandescent lighting is concerned, it does not make the least difference to the consumer whether he pays $1 per 1000 cubic feet for gas of 480 B.Th.U. or $1 a thousand for gas of 660 B.Th.U.' From his data 'it would appear that the incandescent gas-lamp adjusted for maximum incandescence tends to be essentially a constant consumption, constant light output apparatus, independent of changes of gas quality, calorific value, specific gravity, &c.'"

Mr. Pierce writes: About four years ago the author became impressed by the fact that gases entirely similar as regards the customary specifications of gas quality and conditions gave such widely differing results in the incandescent gas-lamp that it was practically impossible to obtain useful comparative data, except from lamps tested side by side upon the same day and at substantially the same hour. The series of tests undertaken with the object of determining, as far as possible, the nature and effects of the confusing and disturbing elements developed some facts that may be of interest in connection with the present discussion of standards of calorific value; and in view of this wider interest and the paucity of definite information on desirable specifications of gas quality, the writer feels justified in offering these data, however fragmentary, for consideration.

While the incandescent gas-lamp is admirably suited in some respects for an investigation of the performance of the bunsen burner, the results so obtained must be taken with due consideration of its limitations. The efficiency of the most important processes involving the uses of gaseous fuel is a function of flame temperature, and the higher the temperature involved in the process the more greatly is the efficiency influenced by the flame temperature. We are perhaps justified in assuming that the relations of flame temperature to efficiency in the incandescent gas-lamp and in other high temperature appliances—such as boilers, furnaces for the heat treatment of metals, metal-melting furnaces, &c.—are sufficiently similar to justify us in taking the relation in the former as at least an index of the relation in the latter group. In the case of bake-ovens, water-heaters, and appliances for processes involving comparatively low temperatures, the efficiency is favourably affected by increased flame temperature, but to a very much smaller degree than in high temperature operations.

It is much easier to obtain the total light output of an incandescent mantle than to measure the average temperature of a bunsen flame; and the results are of a higher degree of accuracy. The performance of gases in an incandescent gas-lamp, therefore, furnishes a convenient indication of their relative availability for other processes involving high temperatures.

In the test from which the results hereafter set forth were drawn, a No. 71 Welsbach upright burner, fitted with a No. 197 mantle (3½ in. by 1⅛ in.) and straight (non-airhole) chimney, 8 in. long by 2 in. diameter, was lighted, adjusted for maximum incandescence, and the horizontal candle power measured daily from Aug. 3 to Nov. 21, 1911. It is assumed that during this period of intermittent burning no appreciable deterioration in mantle quality took place. The gas was tested daily for gross calorific value, specific gravity, and candle power (per 5 cubic feet per hour in the open-flame burner). The temperature and humidity of the air in the room were also ascertained. The gas used was carburetted water gas, and varied in calorific value between 463 and 666 B.Th.U. per cubic foot, between 15·2 and 24·6 candle power, and between ·562 and ·724 in specific gravity. The lamp, which was adjusted at each reading for maximum horizontal candle power, gave between 94·4 and 108·8 horizontal candle power on between 4·25 and 5·15 cubic feet per hour consumption. Atmospheric temperature varied between 60° and 84° Fahr., and the humidity between 2·02 and 8·3 litres of water vapour per cubic metre. The gas pressure was kept constant at 2·5 inches.

This test was planned with a view to demonstrating that calorific value, specific gravity, and gas candle power do not definitely specify a gas for commercial purposes. It appears quite obvious that two gases may be identical as regards these particular qualities, yet so entirely different in composition that the resulting flame temperatures will differ greatly. However, the contrary opinion has been so often expressed that it was considered desirable to demonstrate the fact that specifications of these qualities were valueless for conveying any definite idea of the usefulness of the gas to the consumer.

Table I. shows nine pairs of tests in which the greatest similarity in calorific value, specific gravity, and candle power of gas were obtained—the horizontal candle power being corrected for atmospheric humidity by a method described later. It will be observed that there is no closer agreement of the results obtained with similar gases than between those from gases of entirely dissimilar specifications.

TABLE I.

No.	B.Th.U.	Specific Gravity.	Candle Power.	Cons.	Corrected Horizontal Candle Power.
3	522	·677	20·58	4·55	114·75
13	539	·659	20·46	4·58	116·50
20	542	·654	18·37	4·85	119·30
33	553	·651	18·36	4·64	117·40
21	541	·643	17·14	4·58	117·90
24	539	·653	17·37	4·73	115·50
28	541	·679	19·19	4·49	119·10
29	548	·671	19·29	4·55	116·80
31	604	·633	18·61	4·81	113·85
80	599	·627	18·53	4·48	114·76
32	593	·603	18·28	4·75	115·95
38	585	·609	18·54	4·79	117·50
58	600	·712	18·72	4·65	121·46
59	600	·724	18·39	4·64	118·67
62	610	·653	17·30	4·70	114·05
67	604	·640	17·44	4·46	115·80
64	603	·672	19·39	4·48	116·10
71	606	·685	19·42	4·39	115·50

For example, there is a difference of 2·4-candle power between tests 21 and 24, in which the gases differed by but ½ of 1 per cent. in calorific value, 1½ per cent. in specific gravity, and less than 1½ per cent. in gas candle power; while between tests 3 and 62, the difference in candle power is but 0·7, while that between the calorific value of the gases is nearly 17 per cent., and between gas candle powers nearly 19 per cent. It is quite obvious that specification of calorific value, specific gravity, and gas candle power can never be taken seriously as predetermining the performance of incandescent lighting appliances or comparative tests.

One frequently hears the opinion expressed that, in the ordinary course of manufacture of carburetted water gas, the gas candle power tends to vary, in a way, with the calorific value. In this connection, the following table may be of interest:—

TABLE II.

Test No.	Gas Candle Power.	Calorific Value.
2	24·46	567
63	15·70	592
82	16·30	614
60	18·40	654
41	20·40	450
61	16·32	602
56	20·99	612
53	16·74	612

These are not isolated and peculiar discrepancies, but typical They will not surprise the gas engineer, but will probably conflict with the existing opinions of many whose contact with the manufacturing department of the industry is but casual. [The connection between gas candle power and the luminosity and efficiency of the incandescent gas-lamp was strikingly shown in two curves. The influence of humidity appears quite consistent—within the limits encountered—if one assumes that the irregularities due to varying gas quality tend to counterbalance each other. A line drawn as closely as possible to the average point had the formula: $I = -2{\cdot}716\,h + 116{\cdot}364$.

Where I = horizontal candle power
h = absolute humidity in litres per cb m.

which may be taken as the "humidity characteristic" of this particular lamp on an average carburetted water gas.]

It will be recalled that Mr. Bond [see "Transactions" of the American Gas Institute for 1912—"JOURNAL," Jan. 21, 1913, p. 190] found that a similar lamp sustained a loss of 0·6 per cent. in candle power for each litre of water vapour per cubic metre, as against 2·716 in absolute candle power in the above formula. It is hardly possible to compare the two tests, as they were conducted under entirely different conditions. The effect of humidity was only a casual consideration in the test here reported, and the range of humidity was rather narrow. The writer has no theory to advance in explanation of the discrepancy, but suggests that consistent differences in gas quality might account for it. The gas with which Mr. Bond worked probably had a consistently higher hydrogen content than the gas used in this test; and it is conceivable that the result of the addition of water vapour to a flame already high in this constituent might be less marked than in a flame containing less water vapour as a product of combustion.

The most interesting data obtained from the test related to the effect of varying calorific value upon the thermal efficiency of the lamp—that is, the light output per B.Th.U. input. As one would expect, the duty in horizontal candle power per B.Th.U. decreased with increased calorific value; the increase in B.Th.U. input was mainly due to increased calorific value of the gas, as the consumption tended towards a constant figure.

The formula of the curve drawn as close as possible to the average values is:

$$D = -0{\cdot}00001375\,H + 0{\cdot}0752$$

When D = Duty in horizontal candle power per B.Th.U.
H = Total heat input per hour (calorific value of gas consumption).

It has been shown by St. Claire Deville [see "Transactions" of the American Gas Institute for 1911—"JOURNAL," Vol. XCIX., p. 574, *et seq.*] that the duty of an incandescent gas-lamp expressed in light output per B.Th.U. per hour input has a greater tendency toward a constant value with gases of varying quality than any other feature of lamp performance, provided the ratio between the gas and the primary air is so adjusted as to secure the maximum duty with each gas. Interesting as this may be from a scientific standpoint, and even from a practical standpoint where air under pressure is available, it has no practical bearing upon the atmospheric burner, for the primary air is limited by the entraining power of the injector. Since the proportion of air pressure (or "blast") burners in actual use is insignificant, it would appear that any discussion of the relative economy of different gases should be based upon the performance of the atmospheric burner. These results may therefore furnish a suitable starting-point for a discussion of the relative economy of various gases in high-temperature appliances. Their direct and specific application to the bearing of illumination requirements on the selection of practicable standards of gas service is obvious.

When giving a chart showing the variation in duty with the calorific value of the gas, the author remarks that, at first glance, the data do not seem sufficiently consistent to justify the drawing of a curve assumed to represent average conditions. It will be shown later, however, that these discrepancies are principally due to a variable outside the gas, and that, as far as the influence of gas quality is concerned, a curve having the formula:

$$D = -0{\cdot}0000692\,C + 0{\cdot}08275$$

Where D = duty in horizontal candle power per B.Th.U. per hour,
and C = calorific value of gas in B.Th.U. per cubic foot

represents, within narrow limits, the behaviour of the lamp under consideration with reference to changes in gas quality only.

The most interesting feature of the curve is the fact that the decrease in duty with increase in calorific value is exactly counterbalanced by the latter. For example, comparing gases of 480 and 660 B.Th.U. per cubic foot respectively, it is seen that while the duty expressed in horizontal candle power per B.Th.U. with the former (0·04555) is 37·5 per cent. greater than that with the latter (0·03312), the B.Th.U. per cubic foot in the latter (660) are 37·5 per cent. greater than in the former (480). Thus the cost per candle power hour of producing light in the incandescent burner is independent of the calorific value of the gas. Taking the two gases cited above, the costs per candle power with gas at $1 per 1000 cubic feet in each case are:

$$\frac{0{\cdot}001}{0{\cdot}04555 \times 480} = \$0{\cdot}0000458 \text{ and } \frac{0{\cdot}001}{0{\cdot}03312 \times 660} = \$0{\cdot}0000458.$$

In short, as far as incandescent lighting is concerned, it does not make the least difference to the customer whether he pays $1 per 1000 cubic feet for gas of 480 B.Th.U. or $1 per 1000 cubic feet for gas of 660 B.Th.U.

Incidentally, this furnishes one of the strongest inducements to the gas industry to expand the field of gas lighting. It is recognized by every competent gas engineer that a large proportion of the obstacles encountered in rendering good gas service to the consumer are directly due to the condensable hydrocarbons present in gases of high candle power or of high calorific value. In the case of gas lighting service, the preponderance of troubles due to condensable hydrocarbons is so overwhelming that all other causes appear insignificant. Since it has been shown that incandescent lighting customers gain nothing whatever from increases in calorific value, even at the same price, but on the contrary suffer an actual loss in the quality of service received, the existence of a large and well-established lighting business should furnish the most effective argument to Public Utility Commissions against imposing standards of calorific value that militate against the best and most economical service of the consumer. For at least 50 per cent. of the available gas business in the States, the calorific standard value would be as useless, meaningless, absurd, and ridiculous as the present candle-power standard.

From the data thus far presented it would appear that the incandescent gas-lamp, adjusted at all times for maximum incandescence, tends to be essentially a constant consumption, constant light output apparatus, independent of changes of gas quality, calorific value, specific gravity, &c. That such irregularities and discrepancies as occur are largely due to atmospheric humidity is shown by correcting the data for humidity according to the formula already given. Corrected to dry air conditions, all points lie sufficiently close to a line having the formula:

$$D = -0{\cdot}000018\,H + 0{\cdot}092$$

to justify the definite statement that, within the limits of the test, this formula represents a definite characteristic of the incandescent gas-lamp. The hypothesis that the gases of lower calorific value are comparatively poor in hydrogen, and may be expected to gain more by a humidity correction than those richer in hydrogen, is supported by a comparison of the writer's humidity correction factor for water gas with that of Bond for mixed coal and water gas.

The results of correcting the original candle power figures for humidity conclusively prove that within the conditions and limitations of the test the incandescent gas-lamp is essentially a constant candle power apparatus. The maximum candle power (121·46) is but 8·4 per cent. greater than the minimum (112·0) The mean (116·3) agrees closely with the result obtained by calculation from the formula:

$$I = -2{\cdot}716\,H + 116{\cdot}364$$

from which the value for dry air is 116·364.

One may therefore fix the standard rating of a No. 71 burner with a No. 197 mantle and No. 42 non-air-hole chimney on carburetted water gas and in dry air as follows:

Horizontal candle power. . . 116·3
Consumption . . . . 4·6
Humidity correction factor. . −2·716 per litre per cb m.

The range of variation in consumption from the mean of the test (4·584) is somewhat disappointing, being from − 7·3 per cent. to + 12·1 per cent. While this variation apparently bears no definite variation to any of the qualities thus far considered, there appears to be some hope of devising a specification which shall narrow the range of effect of unknown variables to within much narrower limits. This will receive consideration in a future contribution. For the present we can say that neither gas candle power, specific gravity, nor calorific value is of the slightest value either in predetermining the performance of a lamp or in fixing standards of service for gas lighting.

It is particularly interesting to note the close agreement between deductions from the various formulæ, independently obtained; and in no case was a curve redrawn to agree more closely with other data, nor were any comparative calculations made before drawing the curves. In each case, they would represent purely an ocular estimate of the apparent optimum curve.

There are three values for horizontal candle power in dry air, obtained by three independent methods:

I.—The mean of the corrected candle powers as observed during the test, which is 116·3.

II.—The "dry air" candle power, as calculated from the formula

$$I = -2{\cdot}716\,H + 116{\cdot}364$$

III.—The results of calculation from the formula $D = -0{\cdot}000018\,H + 0{\cdot}092$ to obtain the average value of the horizontal candle power over the range of the test—from 2100 to 3000 B.Th.U. per hour heat input. The close agreement between I. and II. has been noted above. The calculation from III. follows.

$$D = \frac{I}{H} = -0{\cdot}00008\,H + 0{\cdot}092$$

where D = Duty in horizontal candle power per B.Th.U. input per hour
H = B.Th.U. input per hour
I = Horizontal candle power (corrected for humidity)

$$I\ \text{av.} = \frac{-0{\cdot}000018\,H^2 + 0{\cdot}092\,H}{3000}$$

$$I\ \text{av.} = \frac{\displaystyle \overset{H\,=\,2100\text{ to }H\,=\,3000}{\int_{2100}} \left[0{\cdot}000018\,H^2 + 0{\cdot}092\,H\right] dH}{3000 - 2100}$$

$$= \frac{-0{\cdot}00006\,H^3 + 0{\cdot}046\,H^2 \Big|_{H\,=\,2100}^{H\,=\,3000}}{900}$$

$$= \frac{104706}{900} = 116{\cdot}34$$

Calculations of the above formula between H = 2100 and H = 3000 yield the following data:

H = 2100, I = 113·8
H = 2555, I = 117·5 = maximum value
H = 3000, I = 114.

The statement that I is essentially a constant is, therefore, practically correct within the limits of the test. The formula expressing the value of I is, however, an equation of the second degree. Without hazarding any guesses as to the range over which the formula is valid, it may be said that such incomplete results as are available concerning the performance of this lamp on natural gas and on water gas indicate that the formula holds, at least approximately, considerably outside the limits of this test.

Unfortunately, the tests made were upon a type of unit that is not of particular commercial interest at the present time. As stated above, they were made nearly four years ago, and mainly for the purpose of confirming the writer's hypotheses. He did not consider at the time that work upon this subject would command sufficient interest to justify the labour of preparing the matter for publication, although the importance of the subject was obvious. Recent interest in the question of better service standards, however, makes it appear that the data may be useful in that connection.

The Charlottenburg Institute have been investigating as to how far hydrometers are of service in determining the ammonia in gas liquor. Other gases in solution were found to make the readings different, even where the true specific gravities of the liquor were the same. Chemical reactions also interfere with the readings. On the whole, instruments of the hydrometer class do not show the percentage of ammonia present; but for rough working purposes (as at the scrubbers) they give valuable comparative indications.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Briquette Making.

Sir,—I have read with much interest the abstract relating to the above in the "Journal" for June 29, and also your "Correspondence" column of July 13.

I notice that coke-breeze is mentioned as the basis of the briquette. My experience has been that there is no difficulty in burning coke-breeze over ⅜-inch in size, either as fuel for boilers or for other purposes, and as such the present market price is many shillings more than the 3s. per ton mentioned by your correspondent.

In gas-works where the grading of coke and breeze is carried to any extent, the difficulty arises with the dust—*i e.*, material under ⅜-inch in size. Notwithstanding the fact that the calorific value of the coke dust is almost equal to that of the coke or breeze, its conversion into B.Th.U. is not an easy matter.

Some few years ago a briquette plant for coke dust was installed at these works, and is still in operation. Pitch is used as the binding material, and briquettes are made of varying size. I cannot, however, endorse that they compete so favourably with other fuels as mentioned in your correspondent's letter, owing to the density of the briquette when pressed, and the consequent difficulty in its rapid combustion, especially under boilers where steam has to be generated quickly.

To my mind, a better outlook for the coke dust would be its gasification in a separate producer, and the application of the producer gas for the heating of boilers, retort-settings, or other purposes.

W. Chaney, Engineer.

Saltley Gas-Works, Birmingham, July 23, 1915.

German Goods in Dutch Disguises.

Sir,—Having resided over twelve years among English people, I have gained such an absolute confidence in their sense of fairness that I trust you will also place me in a position to clear my firm of an unfair attack caused by an article (reproduced from the "Ironmonger") entitled "German Goods in Dutch Disguises," that appeared in the "Journal" for July 13.

I readily believe that you and your contemporary have been misinformed; and that inquiries made in Holland were not looked for in the proper quarter, but were apparently obtained from someone who had a good reason to cause us damage. If you had made inquiries from some well-known firms in our trade—say, Messrs. Peck and Co., or others who have known us for many years—you would have received quite a different version.

I was at least very much surprised to see that our firm is not known in this country; while I dare say, without boasting, that we have been one of the very foremost firms in the lighting branch for at least twenty-five years.

The original founder, Mr. C. Gautzsch, who died some years ago, converted his business into a limited Dutch Company in 1905—*vide* the Government Gazette: Royal Resolution of April 15, 1905. I can further emphatically state that the young Mr. Gautzsch mentioned in your article is not the proprietor of our business, neither does he hold any interest in it. He is not in our service either, and has therefore no reason whatever for visiting us, even if he could do so.

If your informant had taken the trouble to go into the matter more closely, he would have found that our firm was one of the first to make incandescent gas-mantles in this country as far back as 1896—in their factory, Leliegracht, 25. When, however, the German manufacturers appeared on this market, with cut-down prices, we had to give way. Who can blame us that we grasped the present opportunity to reconquer part of the trade since Germany has had to stand back?

Regarding our capital, I beg to state that, except five shares which are in German hands, all our shares are placed in Holland and are still in possession of Dutch people. An official list of shareholders was submitted to, and approved by, the Home Office some time ago.

I finally beg to state that anyone with any knowledge of the business will readily admit that this modern factory, completely fitted up according to the latest principles, and in which over a hundred Dutch girls earn their daily bread, was not merely put up to serve during the war. We therefore trust that we shall be able to keep same going after the conclusion of the war.

J. Engel, Managing-Director,
Amsterdamsche Gloeikousjesfabriek.

Amsterdam, July 17, 1915.

[We are pleased to publish Heer Engel's explanation regarding the statements published by the "Ironmonger," which (we made abundantly clear on July 13) was the source of our information. We shall now be interested to learn the nature of the reply that will be made by our contemporary.—Ed. J.G.L.]

Munitions Meeting at the Davis Gas-Stove Works.—On Monday of last week, a highly successful meeting was held, under the auspices of the Munitions Parliamentary Committee, at the Luton works of the Davis Gas-Stove Company, Limited. The object of the gathering, which was attended by the Mayor of Luton and the Secretary of the local Recruiting Committee, was "to help, thank, and encourage the workers" of the Company who are now engaged in making munitions of war. Mr. H. N. Davis (Joint-Managing Director of the Company) occupied the chair, and in a few well-chosen words introduced to the meeting Mr. Tom Wing, M.P., the special representative of the Munitions Committee, who addressed the workers in a characteristic and impressive speech, which was heartily applauded by all present. Appropriate reference was made during the meeting to the fact that over 500 of the Company's regular workers are at present absent on military service.

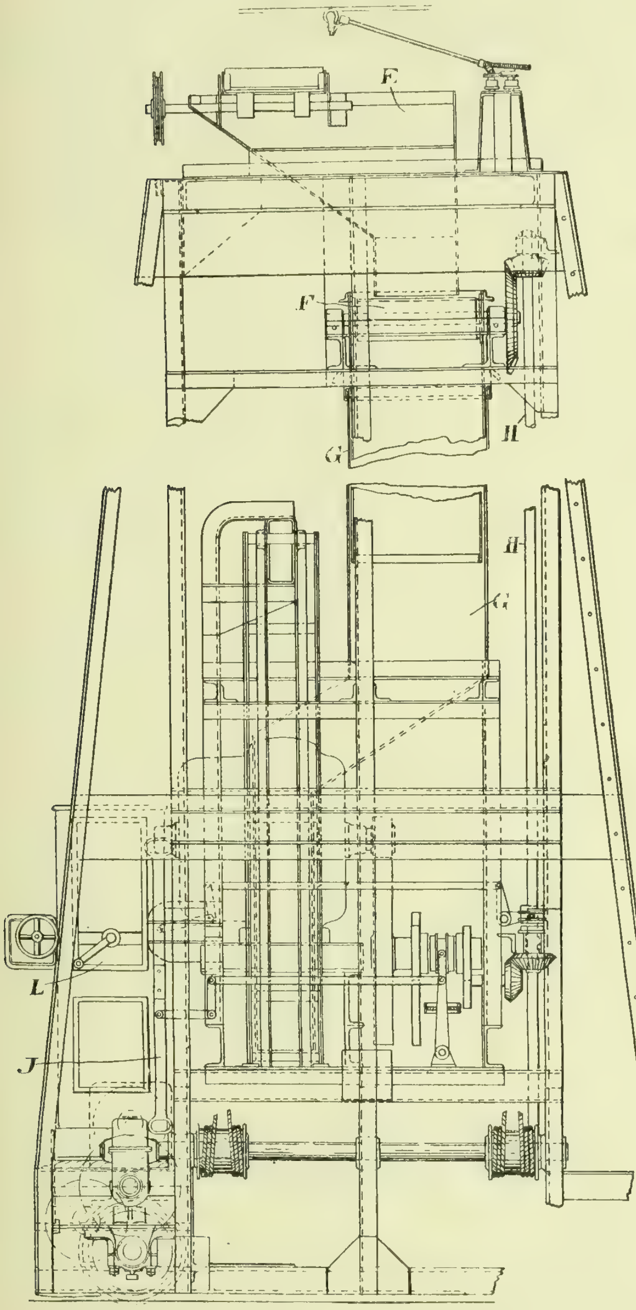
REGISTER OF PATENTS.

Charging and Discharging Gas-Retorts.

Toogood, H. J., and Robert Dempster and Sons, Limited, of Elland.

No. 17,117; July 20, 1914.

In their specification, the patentees remark: In machine stoking of horizontal retorts, as at present practised, certain difficulties arise, which it is the object of this invention to overcome. For example, where a charging machine and a discharging machine are mounted on one framework, it is necessary, after discharging a retort, to traverse the machine so as to bring the charging machine in line with the particular retort. Thus time, labour, and power are lost—a serious consideration when taking into account that meanwhile the retort doors are open and valuable heat is escaping. To overcome this difficulty, machines have been designed to simultaneously discharge and charge a retort at one stroke—that is, the pusher discharging ram, while discharging, conveys the charge of coal into the retort, or guides therein during its withdrawal a projected charge, and on returning leaves the coal lying on the floor of the retort. This, however, introduces a difficulty, inasmuch as in many shapes of existing retorts the resulting charge is not found to be sufficiently heavy to suit the modern needs of gas manufacture.

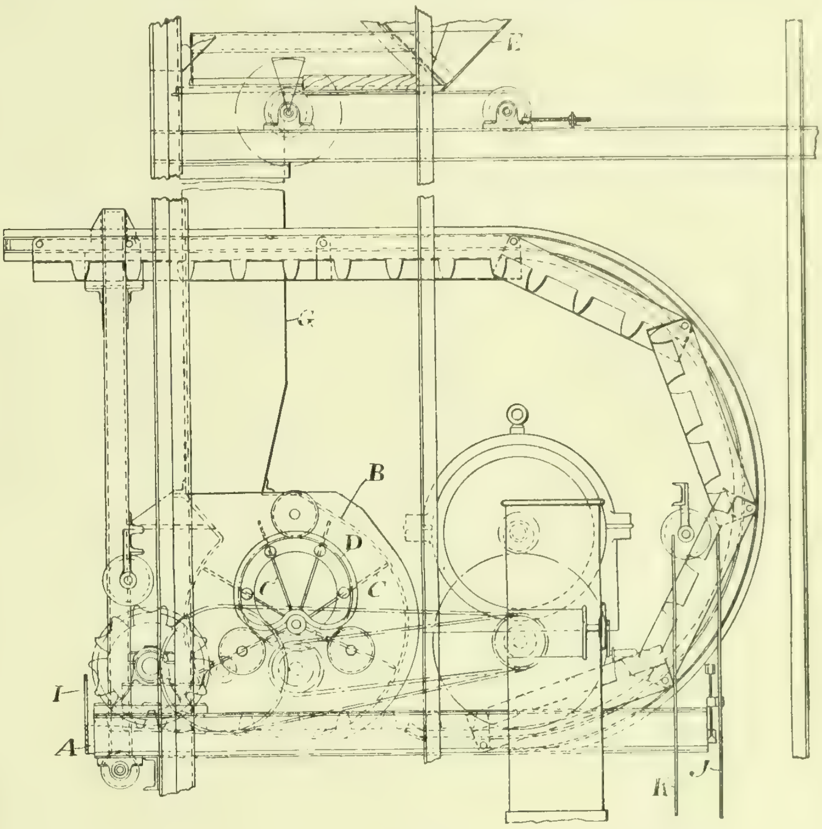


Toogood's (R. Dempster and Sons') Retort Charger and Discharger.

According to this invention, these difficulties are to be overcome by entirely withdrawing the discharging ram from the retort before a fresh charge is introduced; the charging machine, which is of the projector type, being arranged between the side cheeks of the pusher ram, and the ram-head being hinged or provided with an aperture to permit the projection of the charge of coal through or past the ram-head. Should a packed charge be required, the pusher-discharger may be used as a ram-rod to pack the projected charge as tightly as desired—still without moving the machine. Where the ram is in the form of a number of segments hinged together, they are hinged at their outermost points, so as to enable the knuckle joints to pass beneath the charger. "The two machines being thus grouped on one axis, the whole apparatus will occupy a very limited length of retort-house extending beyond the retort-bench."

The illustrations represent a rear elevation of the machine and a side elevation (omitting the travelling carriage and hoisting gear, with which the present invention is not concerned, and which may be of any suitable construction). The travelling carriage, the framework of the machine generally, the motor by which the wheels are actuated for traversing the carriage, the hoisting gear, the motor which imparts the required movements to the feed conveyor, the ram or pusher A, and charger B, are all of the type described in patent No. 6882 of 1904, wherein shovels or plates C are rotated at accelerating or variable speeds by an eccentrically placed drum D.

The coal is supplied from overhead bunkers to the hopper E, and thence to the feed conveyor F, which, when running, delivers the coal at a rate proportionate to the speed of the machine, through the telescopic shoot G into the charger. The feed conveyor is driven by a bevel pinion on a vertical shaft H. The hinged or sliding ram-head I is preferably provided with an aperture through which the charge of coal is shot—the passage through the aperture of a small quantity of hot coke when discharging being immaterial.



The action of the apparatus is as follows: The ram A being brought opposite the retort mouth, and the retort door being open, the handle J is operated to engage the clutch, whereby the ram is caused to advance into the retort and push out the spent charge. The motor is then reversed to withdraw the ram, and the handle thrown over to cause the engagement of the clutch. The charger is thus set in motion; and when the desired speed is attained, the handle K is operated to engage the clutch which starts the feed conveyor F, whereby coal is supplied to the charger and thence to the retort. As the charging proceeds, the speed of the charger can be reduced by operating the controller L; and after reversing the handle K and bringing the handle J to its median position, so as to stop the action, the motor can be employed to bring the machine opposite another retort.

Operating Centre-Valves.

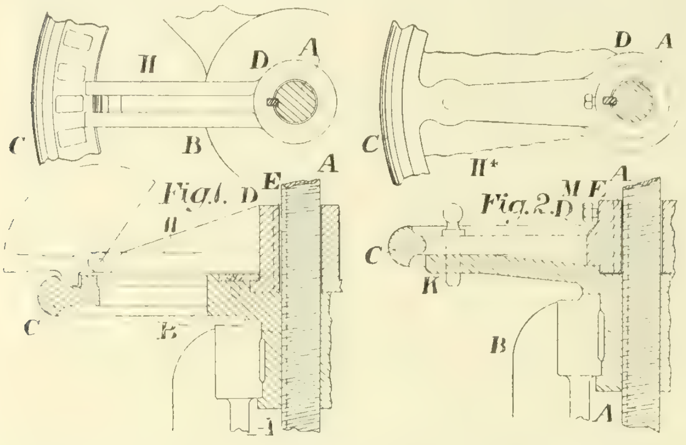
R. & J. Dempster, Limited, Beard, G. F. H., and Scott, J. W., of Manchester.

No. 5812; April 19, 1915.

This invention relates to mechanism for operating disc-valves by screw-and-nut action—as in Weck's centre-valve for purifiers.

It is common knowledge, the patentees state, that in course of time such a valve becomes more or less affected by the accumulation of material from the gas and otherwise, at the contact faces, "making it desirable that such material should be removed or the faces ground by friction clear of the same."

In order that their invention may be understood more easily, they mention that they have used a method of attaining the same object by providing a lever in connection with the nut within which the disc-valve screw worked, and whereby, when desired, the hand-wheel for turning the screw could be turned at the same time as the nut itself was turned by the lever—thus causing the disc valve to rotate instead of rising and falling as in ordinary working, and with the result that the face of the valve could be ground against its seating for the object in view. Continued use of the method described showed that there was an inconvenience in the fact that it was not always possible to turn the hand-wheel of the screw with the one hand, to the same extent as the movement of the nut through the lever operated by the other hand—added to which the lever was always at a fixed level; while the level of the hand wheel varied with the level of the disc valve operated by it.



Beard and Scott's (R. & J. Dempster's) Valve-Operating Mechanism.

Fig. 1 is a portion of a plan and a sectional elevation of one form of the invention applied to the screw in connection with a single or double face disc-valve (not shown), situated within a centre valve. Fig. 2 shows similar views of another form. A is the screw in connection with the disc valve referred to; and B is the nut within which it works. With reference to fig. 2, the hand wheel C, for operating the screw, is attached to the nut, instead of being attached to the screw itself as in the earlier device, and this nut is capable of rotation in its bearings. The screw passes through a collar-piece D, which piece is provided with a feather E (indicated by broken lines), which passes within a key-way formed along the length of the screw. Projecting from D is an attached arm H, having pivoted to it a handle formed with a nose-piece or tooth capable of engaging gaps formed about the outer extremity of the wheel C.

When the handle is raised, as indicated by broken lines, the wheel C is free to turn independently, and the turning will result in the screw A being raised or lowered as desired in the ordinary manner of working. But when the handle is lowered so as to engage one of the gaps or slots in the hand wheel, the turning of it will result in the screw being rotated through the connection or feather E of the piece D. In the disengaged position the nut B and the piece D may be moved independently of each other (in the direction of rotation). In this way the disc valve connected to the screw may be brought to its seating as near as possible, and then be rotated for cleaning purposes. The number of gaps in the wheel C enable the engaging of the parts referred to to be varied according to the position of the valve relative to its seating. The lever arm H and the wheel C are always close together, and the connection between them is a positive one.

With reference to fig. 2, the hand wheel C is attached to the collar piece D; while a disc I is the equivalent of a lever, but is attached to the nut B. A pin K connects the wheel and disc together, and it may be connected by chain or cord to the stud M.

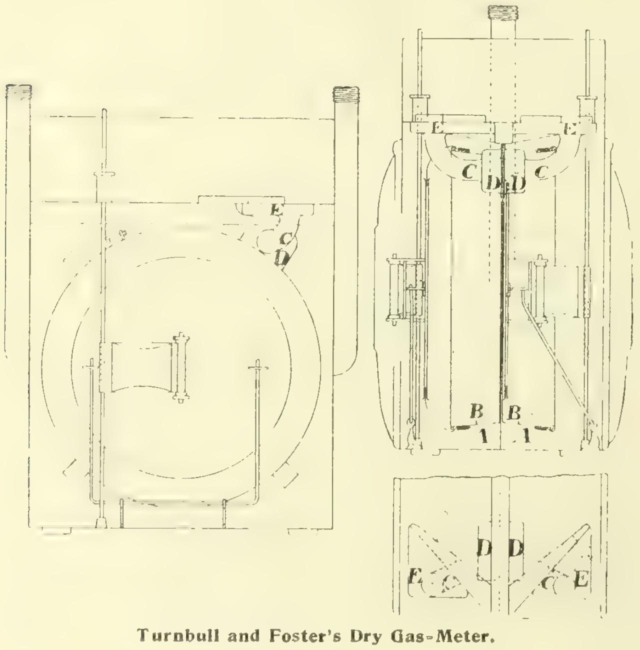
In this example, the pin is capable of passing through a hole in one or more arms of the wheel C, and into one of a number of holes round the circle in the disc. When the parts are disengaged, the turning of the wheel C causes the screw A to turn in the nut B—the latter acting as a fixed nut.

Dry Gas-Meters.

Turnbull, J. W., and Foster, J., of Birmingham.

No. 7728; Sept. 25, 1914.

This invention relates to the dry gas-meters of the type wherein (as patent No. 5029 of 1896) a passage with a right-angle bend is provided between the measuring chamber and a valve grid or the like.



Turnbull and Foster's Dry Gas-Meter.

A front elevation of the meter (with the front removed), a side elevation (one diaphragm being shown inflated, the other deflated), and a plan are given.

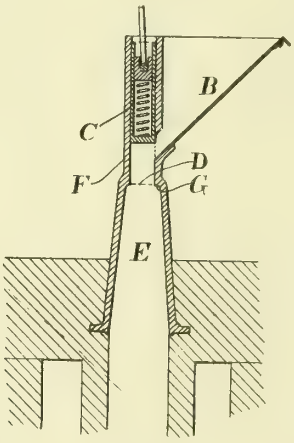
The two measuring chambers A are separated, as usual, by a partition, to the opposite sides of which are attached, by projecting lugs, two shallow circular dishes B, to which diaphragms are secured. To each of the diaphragm dishes is fixed a right-angle bend C, one end of which is fastened to an expansion chamber D communicating with the diaphragm chamber, and the other end to the usual breeches member E beneath the valve grid. By the use of the chamber D in the form illustrated there is provided "a very easy or free-way conduit between the valve grid and the diaphragm chamber, effectually avoiding narrow passages such as absorb pressure by resisting the gas flow."

Retorts or Ovens for Carbonizing Coal.

Slocum, F. L., of Pittsburg, U.S.A.

No. 18,215; Aug. 1, 1914.

In carbonizing coal under pressure applied to the charge in the retort or oven by forcing fresh coal into the retort, the patentee points out that it is impossible to avoid relieving the pressure periodically while the fresh coal is fed between the charge and the ram which exerts the necessary force. During the relief of the pressure the semi-carbonized, plastic coal in the retort is apt to expand, and, carbonization continuing, to lose its plasticity before the pressure is again applied, which is detrimental to the density of the coke produced. He therefore proposes to provide means within the retort (or within an extension) constituting a charging shoot or chamber, for preventing the outward movement of the charge when the pressure applied by the ram is relieved, and thus preventing expansion.



Slocum's Vertical Retort Charger.

Suitable means consists in a constriction or shoulder within the retort (or extension) above the zone in the former in which the coal first becomes plastic. Preferably the extension is provided with a shoulder just below the limit of the inward stroke of the ram, as illustrated.

The coal descends from the hopper B, while the ram C is in the position shown, to fill the extension E and shoot F. The downward stroke of the ram terminates at the dotted line D; and at this level the extension E is formed with a shoulder G. The extension being full of coal, the latter is prevented by the shoulder from appreciable upward movement when the ram is raised. "Hence expansion of the plastic semi-carbonized coal in the upper part of the retort is reduced to a minimum."

APPLICATIONS FOR LETTERS PATENT.

10,157.—Wade, H., "Regenerative furnaces." A communication from the Empire Machine Company. July 12.

10,196.—Gray, J. R., and Alder and Mackay, "Dry gas-meters." July 13.

10,207.—Pinet, A., and Debout, A., "Manufacture of gas." July 13.

10,244.—Duckham, A. M'D., "Removing dust from gases." July 14.

10,250.—Deutsch-Luxemburgische Bergwerks und Hütten-Akt.-Ges., "Ignition of gas burners under water." July 14.

10,265.—Dean, W. T., "Diffusion and distribution of light." July 14.

10,285.—Rogers, R. J., and Cadwallader, W. E., "Gas-fires." July 15.

10,293.—Leech, W. J. B., and Payne, C. R., "Hydraulic mains." July 15.

10,294.—Grafton, W., "Burners for gas fires." July 15.

10,295.—Grafton, W., "Taps for gas-fires." July 15.

10,321.—Beindl, C., "Production of hydrocyanic acid and cyanides." July 15.

10,333.—Brown, W. H., "Gas-stoves." July 15.

10,405.—Fletcher, Russell, and Co., Limited, and Banks, W., "Gas-heated hand-irons." July 17.

Lurgan Gas Purchase.—The Lurgan Urban Council have decided to apply to the Treasury for sanction to the borrowing of £47,000 to meet the cost of purchase, under the Act of Parliament recently passed, of the works of the Lurgan Gaslight and Chemical Company. The date of transfer is to be Oct. 1.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills :—

Bill read the third time and passed : Glasgow Corporation.

The Barnoldswick Water Bill and the Southend Water Bill were returned from the Commons, with amendments, agreed to.

The Dewsbury Corporation Bill, Gas and Water Provisional Orders Bills (Nos. 1, 2, and 3), Lincoln Corporation Bill, Metropolitan Water Board Bill, Rhondda Urban District Council Bill, and the Weardale and Consett Water Bill were read the third time, with amendments, passed, and returned to the Commons.

The Port-Glasgow Gas Bill [Lords] was returned from the Commons agreed to.

The Ashington District Council Bill [Lords] and the Wolverhampton Water Bill were returned from the Commons agreed to, with amendments, which were considered and passed.

The Commons amendments to the Plymouth Corporation Bill [Lords] and the South Staffordshire Water Bill [Lords] were considered and agreed to.

A petition against the Plymouth Corporation Bill has been presented by Mr. Stanley T. Pitts.

HOUSE OF COMMONS.

The following further progress has been made with Bills :—

Bills read the third time and passed, with amendments : Ashington District Council, Plymouth Corporation, Port-Glasgow Gas (without amendment), South Staffordshire Water, Wolverhampton Water.

The Lords' amendments to the Lincoln Corporation Bill were considered last Friday and agreed to.

The House was informed that the Glasgow Corporation Order Confirmation Bill, Rhondda District Council Bill, Weardale and Conset Water Bill, Dewsbury Corporation Bill, Metropolitan Water Board Bill, and Gas and Water Provisional Orders Bills (Nos. 1, 2, and 3), had been agreed to by the Lords ; and also the amendments to the Ashington District Council Bill and Wolverhampton Water Bill.

The first report of the Departmental Committee appointed by the Secretary of State for the Home Department to inquire and report as to the conditions necessary for the adequate lighting of factories and workshops has been presented to both Houses and ordered to lie on the Table.

The Supply of Toluene.

In the House of Commons on Wednesday of last week,

Mr. Touche asked the Under-Secretary of State for War if he was aware that collieries producing toluene for Government purposes were handicapped by the manner in which their men were taken away by the recruiting officer ; and would he endeavour to secure a better coordination of plans between the officials whose business it is to enlist men employed at collieries and those who are pressing colliery owners for products urgently required for munitions, the output of which was being restricted by recruiting.

Mr. Tennant, in reply, said : The question of the limitation of the enlistment of coal miners is engaging the careful attention of the Secretary of State in conjunction with the Home Office.

Westphalian Coal Syndicate.

The following question was replied to in the House last Thursday.

Mr. Montague Barlow asked the President of the Board of Trade whether Herr Hugo Stinnes, the representative of the German coal monopoly known as the Westphalian Coal Syndicate, has within the last few years conducted large operations for the purchase of Welsh coal in Cardiff and Swansea ; and whether he has purchased, or has acquired interests in, any coal mines in Wales or other parts of the country.

Mr. Runciman replied that large purchases of coal were made in Cardiff and Swansea during the last few years by Hugo Stinnes, Limited—a company in which all the shares were held by Mr. Hugo Stinnes. On the application of the Board of Trade, the Court appointed a Controller of the Company in December last, and the Company's operations have recently been limited to realizing certain of its assets and discharging the debts owing by the Company in this country. He had no information that interests in coal mines in Wales had been acquired by Mr. Stinnes ; but 48½ per cent. of the issued capital of the Northern Union Mining Company, Limited, was registered in the names of Mr. Stinnes and Hugo Stinnes, Limited, a further 48½ per cent. of the issued capital being held by a German company. The Northern Union Mining Company, Limited, had acquired extensive coal mining leases in Yorkshire and Nottinghamshire, and a supervisor of the business was appointed last December.

The Budleigh Salterton Urban District Council have appointed a Sub-Committee to meet the Directors of the local Gas Company respecting the public lighting of the town, which is now entirely suspended. The police are prepared to sanction 52 of the lamps being lighted, so long as they are not visible from the sea front. Meanwhile, the Gas Company have sent in their quarterly account to the Council, with the promise of a rebate.

PRICE OF COAL (LIMITATION) BILL.

THE DEBATE ON THE SECOND READING.

Monday, July 19.

The Bill to provide for the limitation of the price of coal, presented by Mr. Runciman, the terms of which were given on p. 137 of the "Journal," was ordered for second reading on Monday of last week.

Sir Joseph Walton, in moving, as an amendment, that the Bill be read a second time "upon this day three months," said he wished it to be clearly understood that he would not allow either coalowners or any others engaged in any trade or business to enrich themselves by the retention of war profits. Any legislative proposal to prevent this on broad and equitable lines would have had his strongest support ; but he condemned this Bill on the ground that it penalized one great industry only, and left others making huge war profits to go scot free. Though the Bill might be regarded as of a temporary character, it was difficult to retrace a step of this sort if once taken. To say the least, the Bill was an alarming interference with the hitherto free right to contract ; and it was a violation of the principle of Free Trade. The policy of having a maximum price fixed by the State, if adopted at all, must be applied equally in all trades and industries affected by the war. The colliery owners were prepared to make great sacrifices for their country. They made little protest when the Government commandeered practically the whole of the steamers which had been legally chartered to convey coal to London at 3s. per ton. In his opinion, this did not justify the Government in charging for interned German steamers performing the same service 13s. 6d. per ton, when they were allocated to replace the steamers which the Government had taken. The partial prohibition of exports had already forced down the price of coal many shillings a ton ; and markets were being lost which it would be difficult to regain. Having no outward cargoes of coal raised the cost of freight, and consequently the prices of meat, wheat, and other necessaries of life to the consumers in this country. There was a widespread idea that all coalowners had made colossal profits since the outbreak of war. This was certainly not true so far as regarded the majority of the collieries in the districts he knew best. The average price realized for Durham coal, as ascertained by the auditors of both the men and the masters, in the first quarter of 1915, as compared with the first quarter of 1914, actually showed a reduction of 5d. per ton. A great deal had been heard from gas companies and railway companies about coal prices. With regard to the former, the greatest exaggeration prevailed. For instance, the great gas companies of London were receiving to-day, and would receive for months to come, large quantities of coal at less than cost price. If the State now intervened and arbitrarily fixed the price that the coalowners were to be allowed to charge the gas companies, preventing them from recouping the loss—the heavy loss, in many cases—that the owners were at present sustaining, and at the same time left the gas companies free to charge, as they were doing, more than twice the price for gas coke and to exact from the Government enormous prices for toluol and other residual products, this was a one-sided and unfair arrangement. There was no doubt whatever that the idea contemplated in the Bill of fixing a pit-head price and then apparently leaving the merchant free to exploit the consumer to his heart's content, was one that was absolutely indefensible. As to the provisions, he could not congratulate the President of the Board of Trade on the clearness of the drafting. There were many contracts for coal still running which were made before the war at prices substantially below the present cost price. His belief was that the most unfortunate and lamentable stoppage in South Wales would have been averted, as would many other labour difficulties, had the Government boldly declared months ago that the increased profits of coalowners and of all other traders, manufacturers, and taxpayers during the war would be taken as a War Tax into the Treasury. If he were not successful in securing the rejection of the Bill on its second reading, and if the House would not sanction the taxing of the whole nation through its coal supply, he would suggest that the Bill be limited to fixing the prices householders should pay for coal for domestic purposes—not the pit price, but what they paid when they received the coal into their cellars - omitting altogether any attempt to fix a price for manufacturing and other purposes.

Sir Richard Cooper seconded the amendment, and urged that, if anyone had been bleeding the public in the price of coal, it was the merchants and dealers far more than the coalowners.

Mr. Runciman said the object the Government had in introducing the measure was to deal with the price of coal at its source ; for the simple reason that the price to the retailer must invariably be affected by the price of coal at the pit-head. A shilling rise in the price of coal used within these shores, represented no less than £9,000,000 ; and whatever the average rise was over the country as a whole, there was no doubt the increased cost of coal over the whole year must have represented somewhere about £20,000,000. It would be unfair to limit the Bill only to household coal. Looking at all the figures, it would be seen that the output of coal had gone down less rapidly than the enlistment of men had gone up. Large numbers of contracts had already been made, some at only 2s. 6d. or 3s. above last year's prices, and some a good deal more. Nearly all the large consumers bought direct from the coalowners ; and there was no doubt that the coalowner controlled the price of coal. Taking the country as a whole, so far as he could ascertain, the extra cost of giving the war bonus grant to the men would not be below 9d. or over 1s. per ton. There had also been other advances in wages which would add to the cost of getting coal. When all the extra costs were added together, the total amount by which the expense of getting the coal had been increased was something over 3s. a ton. Therefore 4s. was inserted in the Bill as being fair to both sides. He did not think the House could reasonably insist upon existing contracts being disturbed by the Bill. He had to confess that they had not been able to devise any means by which they could reasonably get hold of the middleman's profit, except that of taxation. The members of the London Coal Exchange had, however, given him an undertaking that the charge for coal was not to exceed by more than a certain number of shillings the price delivered to depôts in

London, this summer and in the coming winter. Those whom he had consulted had been strongly of opinion that the price of export coal should not be limited.

Mr. Russell Rea, in the course of a speech dealing with the work of the Coal Exports Committee, of which he is Chairman, denied that the action of the Committee had caused collieries to stop for want of orders from foreign countries. There were districts which were dependent upon the export trade for their working; and they had lost their largest customers. To all the collieries which were left open to the operations of the Committee, they had been most indulgent. They had given them every licence for which they had applied, except in cases where the shipper or consignee was a black-listed person or an alien enemy, or a suspected person. They had gone further than this, and refused to licence shipments from districts where they were able to dispose of their coal at home, and where they were not dependent upon the export trade. As showing the urgency of the question the Committee had to consider, he pointed out that, when they began their operations, public utility companies found their stocks growing dangerously low. He believed at one period the South Metropolitan Gas Company were within eleven days of stoppage. The London Gas Companies, and all the companies engaged in works of public utility, were extremely alarmed and in very considerable danger two or three months ago; and they set themselves to work under an organization to accumulate stocks in the summer. They calculated that they must get, not only a supply equal to their weekly consumption, but also at least 25,000 tons a week in addition, in order to face the winter. He was happy to say that, during the last two months or more, they had succeeded in putting by, not only the 25,000 tons a week which they required, but about 150,000 tons beyond this. So that, on the whole, the situation was not so bad as they feared it might become a few months ago, when the Coal Exports Committee was appointed. The production of coal, when one considered the number of men who had left the collieries and gone to the front—and these were the best men—had been extremely satisfactory. The amount produced per man had actually gone up, though they had had in the collieries much less experienced men.

Mr. Walsh, while agreeing that there was a general wish that the object the Bill had in view might be accomplished, remarked that how anyone could be induced to believe that the dominant factor in the selling price was the pit-head price, and that once this was fixed at a reasonable figure all other things would practically accommodate themselves thereto, passed his comprehension.

Mr. Lawrence Hardy remarked that, though he had no actual right to speak on behalf of the mine owners, he believed that large numbers did not agree with the action taken by Sir Joseph Walton in moving the rejection of the Bill. One thing which undoubtedly the mine owners did feel very strongly was that they should have been picked out as the only persons to whom such drastic legislation should apply; while they were firmly convinced that the very high prices to which objection had been raised were due much more to the action of others than of themselves.

Sir Edwin Cornwall, rising to support the principle of the Bill, said that the London market for coal, as was the case with everything else, was subject to the keenest competition there could possibly be. In his opinion, the Bill ought to apply to contracts; but it should not be retrospective from the point of view of any coal delivered. It should apply to contracts from the date of the passing of the Act. It must be borne in mind that 80 per cent. of the coal produced in the country had already been sold under contract; and if the measure did not apply to contracts, they would be passing a Bill which dealt with a very limited supply of coal.

Mr. John O'Connor appealed for separate treatment for the few small collieries which he pointed out exist in Ireland.

Mr. Dickinson suggested that, if it was impossible to adopt the plan of actually fixing the price at which the coal was to be sold to anybody in London, there might be a better method of distribution. Again, he could not help thinking that the insertion of the clause in the Bill that it was not to affect any contracts would rob it of nine-tenths of its value.

Sir A. Markham said the Bill was the result of a proposal he made to the Government last January; but as now presented to the House it was absolutely worthless so far as the general consumer in the country was concerned. If the Government had, in the first place, made a definite pronouncement that all surplus profits over and above the average of the two or three years before the war would be taken by the State, there would have been no strike in South Wales. The Government had failed to take any steps whatever to let the people who were making these profits know that they ought not to make them. It was perfect nonsense to say that the price of coal had risen by anything like 3s. a ton on the average of the collieries of the country. If the amount was split in two, one would be getting nearer the truth. But under the Bill they were going to invite the colliery owners to take an increased price of 4s. per ton. The cost of delivering coal had very largely increased—something like 1s. 6d. or 2s. a ton, he thought, in London. Surely a clause could be drafted to "rope in" the middleman, once the main principle was agreed that the coal merchant was to charge no higher price than before the war. He intended to move in Committee that all contracts entered into for deliveries from and after the passing of the Act should be set aside. He would also move that the collieries should send to the Board of Trade the average prices they had received for the different classes of coal in the twelve months preceding the war; and to these prices he presumed the 4s. would be added. Unless the alterations he suggested were made in the Bill, the country would next year "still be fleeced and robbed at every turn by the middlemen."

Sir J. Harmood-Banner asked whether the suggestion was that contracts which were bad for the collieries should be broken as well as the good ones.

Sir A. Markham replied that his contention was that every contract should be cancelled which was in excess of the terms provided for under the Bill.

Sir J. Harmood-Banner (continuing) said he was a member of the Federated Coalowners; and while he could not state that they welcomed the Bill, they were quite prepared to fall in with it and do their best to carry it out.

Sir Joseph Walton remarked that if the President of the Board of Trade had made his speech before he (Sir Joseph) spoke, it would have modified his attitude on the Bill. In the hope that it might be amended in committee, he begged leave to withdraw his motion.

Mr. Pretyman (replying on the debate, in the absence of Mr. Runciman) said many of the criticisms which had been directed against the Bill would be unanswerable if it were a peace measure, and if it were a precedent which would lead them in this or that direction. But nothing done in war was a precedent for what would be done in peace. He suggested that if they could succeed by the Bill in establishing a basis price at the pit-mouth, they were going to have the minimum disturbance of industry. To go back on contracts would create many cases of inequality and hardship in the distributing trade.

Sir A. Mond pointed out that, though the Bill limited the price of coal, there was nothing in it which compelled anybody either to raise any coal or sell any coal. He could not see why it would be unfair to cancel contracts made (say) within the last three months.

Mr. Outhwaite said that within the past three weeks contracts at very high prices had been made; and he could not see why they should be respected.

The Bill was then read a second time, and committed to a Committee of the whole House.

THE BILL IN COMMITTEE.

Thursday, July 22.

When the Bill was in Committee later in the week, the various provisions which are contained in it were discussed at great length. A number of amendments were moved, some of which were negatived, while others were withdrawn.

One of these amendments was that the standard amount of 4s. mentioned in clause 1. (sub-section 2) of the Bill should be altered to 3s. The Committee divided on this, with the result that it was agreed, by 77 votes to 33, that 4s. should stand part of the clause.

The Question of Contracts.

Mr. Goldstone moved, at the end of sub-section 2, to insert:

> "(3) In every contract for the sale of coal at the pit's mouth under which such coal has been sold but not delivered at the time of the passing of this Act, it shall be an implied term that the price of such coal shall not exceed the lawful price as determined by this Act; and any disputes arising therefrom shall be submitted to the Board of Trade for determination, in accordance with the Board of Trade Arbitrations, &c., Act, 1874."

He thought that this amendment was probably the one of most consequence. Without it the Bill, from the point of view of the household consumer and from the point of view of authorities who had large gas and electricity works, would be valueless. If the Board of Trade, at the outbreak of the war, had accepted responsibility for the coal mines as they did for the railways, a good many present-day difficulties would not have arisen. Unless this amendment was accepted, many of the contracts, representing probably about 70 per cent. of the output in the next year or so, would not be touched by the Bill.

Mr. Anderson remarked that unless the amendment, or one like it, were carried, it would mean that 80 per cent. of the coal for the next twelve months would be outside the scope of the Bill altogether. If it was possible for the coalowners to interfere with their contracts, it was possible for the same principle to be applied all round. It was unfair to the great municipalities not to interfere with these contracts. They heard again and again in the House of the need for public economy during the war on the part of the great municipalities. They agreed with this, though some of them did not carry it to the length that others would. What scope was there for economy when one got figures like these: This was the Glasgow Corporation's new bill for their coal supply for gas and electricity—811,000 tons for gas at an increase of 5s. 3d. per ton, and 160,000 tons for electricity at an increase of 6s. 3d. per ton. The total increase in the Glasgow Corporation's coal bill was going to be over £265,000. And then they asked the cities to practise economy. The very best way they could help the Glasgow Corporation to practise economy would be by relieving them of the increase on their coal contracts, and allowing them to get back to more normal figures. The same thing was true of the traders.

Mr. Pretyman said that, however much they might all wish to get the great advantage which this amendment would confer upon the community, on the whole it would take the Bill into a region into which they could not attempt to travel at this time. He hoped that, looking at the matter in this light, those who had proposed the amendment would be prepared to accept the lesser benefit the Bill proposed to confer, and would not attempt to confer the larger benefit which the Department concerned felt it could not agree to.

Mr. Mackinder said he represented a constituency in which very keen interest was taken in the Bill, not only by those who were merely domestic consumers, but also by those who were great industrial consumers, both of electricity and of gas. There was one question which was being asked in his constituency, and which would be asked; and he was going to put it now, because he hoped that the President of the Board of Trade would be able to give a satisfactory answer to it. He believed it was on the 6th of May last that the great meeting was held in London of the users of coal, and especially of representatives of what were commonly known as the public utility companies and municipalities. These municipalities and these great statutory companies raised the question at the meeting in the beginning of May, because they knew that immediately in front of them the time was approaching when the twelve months' contracts would have to be made. The question was being asked at the present time, and in no mincing phrases, what could be the state of inefficiency which could allow nearly three months to go by before a Bill was introduced, apparently designed to meet the very difficulty which they raised last May—a Bill which was introduced in a form which was almost ironical to them, and which would be described as a Bill "shutting the door when the horse had been stolen."

Mr. T. M. Healy argued that, though the amendment might, perhaps, go too far in applying to all contracts, it should certainly apply to contracts made since this agitation began—namely, May and June contracts. Take gas companies, would not the House have been flooded with Private Bills to enable gas companies to raise their statutory charges, but for the hope and expectation that the Board of Trade would deal with the matter?

Sir A. Markham remarked that it was no good the coalowner and the coal merchant saying they had not had the plunder. The public had had to pay. They had all had their finger in the pudding. He had had his—he had had more than he was entitled to.

Sir A. Mond remarked that, after all, the whole doctrine of the sanctity of contract was built upon the idea that there were two independent contracting parties who were at liberty to contract or not to contract. They were not talking now of people in the position of free and willing contractors, because one of the parties were bound to contract or close-down their gas-works or electric lighting works. He could not understand why some warning had not been given to all these public bodies that this legislation was going to be produced and telling them not to buy for a month. He would have thought the right honourable gentleman could have given his advice confidentially in this way. How did they know whether he would introduce a Bill, or what maximum price he was going to fix?

Mr. Runciman said that the suggestion which had been made was that, owing to necessity, local authorities had been bound during the last few weeks to make contracts above the standard prices in the Bill. He understood that a large number had been squeezed, in Scotland as well as in England; but very many had refrained from doing so, and would undoubtedly get the benefit of the Bill, if it passed. If the Bill had been introduced in April, this would have been before the war bonus was decided upon, before the re-adjustment of wages in Scotland, and before there had been anything like equilibrium in the Welsh coalfield. It would have been introduced at a time when materials were fluctuating in price with great rapidity, and at a time when it would have been impossible to state with any degree of accuracy whether 3s., 4s., or 5s. would be anything like a fair sum to put in the Bill. The Glasgow Corporation, by whose special case the Committee had been much impressed, bought before the Bill was introduced. It might be that they did their best to avoid doing so, and that their stocks were so low that they could not afford to run the risk of the market in any degree. If this were the case, there might certainly be some good reason for taking the position of the Corporation and others into due consideration. But this was quite a different proposition from the one before the House. The amendment would strike at the root of all commercial stability. It would cause a great deal of trouble and mischief in nearly all the industries, and would certainly do no good to those whom they wished to benefit. But the special case that had been put of corporations was one which he thought the Government were bound to consider; and he suggested that the amendment should not then be pressed to a division, and that the Government should, between now and the report stage, endeavour to meet the case of local authorities and those public utility companies which were limited in the payment of dividends. In one form or another the local authority was the State; and it might be that they were doing right to protect the State with respect to some of these contracts. He was very doubtful about the principle of the thing; but the Bill was purely one of expediency, and to deal with the case of the local authorities was quite a different matter from tearing-up all contracts which had been entered into before the introduction of the Bill. If they would negative the amendment, he would undertake that the Government would see what could be done for the local authorities and those in similar positions.

The amendment was negatived.

THE PENALTY PROVISION.

An amendment was then accepted to add to the words "if any person sells or offers for sale," the following: "Provided that a person shall not be liable to a fine under this provision if he shows that he had reasonable grounds to believe that he was not committing an offence."

Friday, July 23.

AN AMENDMENT AS TO CONTRACTS ACCEPTED.

Mr. S. Roberts moved to add, at the end of sub-section 4 of clause 1.:

> (5) It is hereby declared that nothing in this section shall affect the rights or obligations of any person under any contract or agreement for the sale of coal, except, in cases where the sale is in contravention of this section, as respects so much of the price as exceeds the maximum price which could have been charged for the coal if there had been no contravention of this section.

He pointed out that the words of clause 1 were that a contract which went beyond the price proposed in the Bill would be void. His amendment would make it only void as to the excess price of the coal over the standard price.

Mr. Runciman agreed that the request was not altogether unreasonable, but expressed the opinion that if the price was above that provided for in the Act, the customer ought to have the right to say whether or not he would go on with the contract.

Mr. M. Healy said that, as the Bill stood, he apprehended that there would be no reason in the world why the person purchasing coal should not set up the defence that it had been sold in breach of the Statute, and so endeavour to escape payment.

Sir W. Beale remarked that if the Government could accept an amendment substantially to this effect, he thought it would make the position a great deal clearer in law, and more equitable.

Mr. Runciman said it seemed to him there was something in favour of such an amendment as this; but he did not think it would be advisable to take it in exactly the form named. The better course would be to accept the amendment now, and put down amendments to it on the report stage.

The amendment was then agreed to.

SUGGESTED REVISION OF CONTRACTS.

Mr. Dickinson moved, in sub-section 2 of clause 3, to leave out the words "commencement of this Act" [The sub-section reads: "This Act shall not apply to the sale of coal supplied in pursuance of a contract made before the commencement of this Act."], and to insert instead the following words:—

> 24th day of March, 1915. Provided that in any contract made between the 24th day of March, 1915, and the passing of this Act, it shall be lawful for any party thereto to give notice to the other party that he desires the contract to be revised with respect to coal to be supplied after the date of the notice; and thereupon he may apply to a judge of a County Court, who may revise the contract and may fix the price or prices to be paid for the coal to be supplied thereunder so as to make such price or prices equal to the price or prices which in the judge's opinion would have been inserted in the contract had it been concluded on the basis of the price or prices of the coal at the pit's mouth as fixed under the provisions of this Act.

The Deputy-Chairman (Mr. Maclean) doubted whether, in view of the debate on the previous day, when an amendment as to contracts was negatived, he could allow this one to be moved.

Mr. Dickinson submitted that his was an alternative amendment. The first referred to all contracts; whereas his own did not.

Mr. Runciman said while the House had undoubtedly negatived any proposal for the tearing-up of all contracts, he would like to repeat the suggestion he had already made—that this subject must of necessity be dealt with, and reviewed by, the Board of Trade before the Bill arrived at the report stage. He hoped then to be able to make proposals which would remove some of the difficulties raised by this amendment.

The Deputy-Chairman explained that, as the President of the Board of Trade had suggested the previous night that he was prepared to consider the tearing-up of contracts with regard to specific bodies, he was left in a rather difficult position owing to the fact that technically the amendment was negatived. He thought, however, it would be better not to press the amendment now.

This course was agreed to.

Sir A. Markham said the view that contracts were a sacred obligation which ought not to be disturbed was one that did not hold in times of national danger. It was not going to be a real living Bill if it dealt with only 20 per cent. of the output.

Sir C. Cory pointed out that coalowners who entered into contracts at extremely low prices to keep the pits going were still carrying them out; and it appeared only right that these owners should have the benefit of higher prices obtainable.

Mr. Anderson asked why, if the President of the Board of Trade was prepared to modify contracts in regard to coal going to the municipalities, he should not do the same with respect to coal which was going to be supplied to working-class households. In regard to manufacturers, the case was equally strong.

Sir E. Cornwall thought by this time the President of the Board of Trade had realized that there was a very strong feeling in favour of applying the Bill to contracts.

Mr. Watt, again referring to the Glasgow Corporation contracts, asked for an assurance that corporations who had been "squeezed" would be considered.

Mr. Runciman replied that he could add nothing to what he said on the previous day. One of the charges just brought against him was that he then said he would do something to help the local authorities, who in another aspect were really the State.

It having been decided that the Act should not apply to Ireland, clause 3 was agreed to.

LIMITING CHARGES FOR WAGGON-HIRE.

The following clause dealing with the limitation of charge for waggon-hire was then added to the Bill:—

> (1) Where coal is conveyed from the pit's mouth over any railway in trucks not belonging to a railway company, the seller of such coal shall not be entitled to charge for the use of the trucks any sum exceeding by more than 50 per cent. the sum which the railway company conveying the coal was actually charging for the provision of trucks at the commencement of this Act.
>
> (2) If any person charges or attempts to charge for the use of any trucks in contravention of this section, he shall be liable, on summary conviction, to a fine not exceeding £100.

After another new clause—to limit the retail price of coal in London—had been withdrawn, the Bill was reported. This clause had for its object the limiting of the selling price of coal in London to a "sum equal to the price of that coal at the pit's mouth as fixed under this Act, together with the addition of 15s. per ton, or such greater amount, as the Board of Trade may allow in view of any proved increase in the cost of freight or distribution."

War Bonus Question at Sedgley.—When the Sedgley Urban District Council approved a recommendation of the Gas Committee to grant a war bonus of 1s. 6d. a week to the general gas workers, one of the members remarked that the men were not satisfied with this offer, and had decided to refuse it. He urged, therefore, that the question should be further considered. However, it was pointed out that the Council had no official knowledge that the men would refuse the grant and, under these circumstances, no further action was taken.

Big Destruction of Benzol.—Thousands of gallons of benzol were destroyed through a fire which occurred on Monday of last week at the Milnsbridge chemical-works of Messrs. J. W. Leitch and Co. The outbreak originated in a still in the benzol department; and directly after the alarm was given, there was an explosion, the report being heard for miles around. Several minor explosions occurred later; but, though many men were working at the time, only one was hurt, and his injuries were not serious. The benzol department consisted of seven sheds, six of which were gutted.

LEGAL INTELLIGENCE.

CHARGES AGAINST FORMER GAS OFFICIALS.

Accounts of the Walton-on-Thames and Weybridge Gas Company.

CENTRAL CRIMINAL COURT.—Thursday, July 22.

(*Before the* Recorder of London *and a* Jury.)

Thomas Henry Lamb, lately Secretary of the Walton-on-Thames and Weybridge Gas Company, and George Waters Ross, until recently the Chief Clerk and Collector to the Company, surrendered to their bail to answer several charges arising out of alleged tampering with the books and funds of the Company. In the first place, they were indicted for unlawfully conspiring together to steal divers sums of money belonging to the Company; with making certain false entries in the books of the Company; and with omitting certain material particulars from the said books. To this, both prisoners pleaded "Not Guilty." Another indictment charged them with feloniously stealing certain sums of money—£88 7s. and £445 6s. 4d. A further indictment charged them with stealing £100 8s. 8d., £17 10s., and £99 7s. 4d. To these two indictments Lamb pleaded "Not Guilty" and Ross pleaded "Guilty." It will be recalled that the trial was removed, by order of the High Court, from the Surrey Quarter Sessions to London, after the case had been before the Magistrates at Kingston.

The charge against Lamb of stealing the three last-mentioned sums was proceeded with.

Mr. W. H. Moresby (instructed by Mr. W. L. J. Crosby) prosecuted Mr. Ernest E. Wild, K.C., and Mr. A. S. Comyns Carr defended Lamb; and Mr. David White appeared for Ross. The Solicitors for the defence were Messrs. White and Co.

Mr. Moresby, in opening the case for the prosecution, said the Jury had heard the charges read out; and they would have gathered from the recital of them that they were serious charges. The question they would have to consider was whether Lamb, while in the service of the Gas Company, stole the three sums of money which had been referred to. He had said the charges were serious; and they were so, indeed. They were grave charges; and they were regrettable ones. They were regrettable, because if they were proved they must involve the downfall of a man who had been a thoroughly respectable person hitherto, well known in his district, and who had been for no less than 23 years Secretary of the Gas Company. While holding this responsible position, he had received an adequate salary of £265 a year, and had had a house, gas, and coals free; so that his position was a comfortable one. It was necessary to explain that this was not altogether a simple case; and there were one or two preliminary matters to which attention should be drawn. The Gas Company, as was the custom with such undertakings, had a main office—the Secretary's office—which was situated in Walton-on-Thames; and this was under the absolute control of the prisoner. All cash that was owing to the Company, for gas consumed or for residual products, was paid in to this particular office, and came under the immediate control of Lamb. Now Lamb, in this office, had with him the other prisoner, Ross (who had pleaded guilty) as the collector, to work with and under him; and the only other living soul in the office was a junior clerk he believed about nineteen years of age. The keys of the safe were possessed by Lamb and Ross; and it was important to notice, because it was a leading feature in the case, that all the accountancy relating to the money so received was done in this office, and Lamb alone was responsible for it. All the Company's books relating to receipts for gas and residuals were kept in this office; and the books to which it would be necessary to refer in this case were very few and very simple. In fact, there were only three particular books to bear in mind. The first was the daily cash book, in which all cash and cheques should be entered as and when received; and it would be obvious to anyone that a book of this kind must be the basis of all accountancy, because it was the first record of money received into the business. The second book was the general cash book, into which entries from the first book should be periodically made—say, weekly—and summarized; so that it was, in a sense, a second edition of the first book. The remaining book was the meter ledger, in which the various meter readings were entered from the readers' cards. In this book, also, the consumption was worked out in money values; so that there were really two entries. The duty of the prisoner was to enter the receipts in the first book, or see that they were entered—by Ross presumably—and having seen that they were entered, he had to make quite sure that when he paid into the bank periodically these payments were equal to the recorded payments in the book. This was his duty; and it was a duty in which, if his (Counsel's) information was correct, prisoner lamentably failed. Coming to the amounts specifically set forth in the charge, the £100 8s. 8d. related to a cheque from Messrs. Clayton, Limited, for tar. This cheque was duly received in the Secretary's office, and was endorsed by Ross, though the receipt for it was signed by Lamb. It was, however, not entered in the first book; and then, the process being started in this way, the following step was to pay the cheque into the bank. As it was not recorded in the daily cash-book, it would, of course, free an equivalent sum of money for Lamb to appropriate, if he liked. On an examination of the Company's books by skilled persons, it was discovered that a very large deficiency of funds existed; and the inference he would ask the Jury to draw was that not only could Lamb make use of the money so set free, but that he, in fact, did make use of it. In a charge of this kind, it was not in the least necessary to prove the theft of a specific sum on any particular day. If a fraud of this kind was perpetrated, it was quite impossible for the prosecution to say, "On such and such a day you stole these particular coins." The law did not require it; and the exigencies of this particular case prevented him saying that it did take place. It was quite obvious that the ingenious method of setting free a sum of money to be appropriated, which he contended was adopted by Lamb, might very well go on unobserved for a long time. It did, in fact, in this case go on until somebody, for some special reason, closely examined the account in question—that of Messrs. Clayton. The second cheque was for £99 7s. 4d., and related to the account of Messrs. Page and Co. for sulphate of ammonia. The facts were very similar to those of the preceding case; but this time the cheque was endorsed by Lamb, so that he knew right well that the amount was received. The receipt was signed by Ross. Again, no record appeared in the daily cash-book; but the cheque was ultimately paid in against recorded payments in this book, so setting free an equivalent amount of money received by the Company on some other day unknown to the prosecution, and misappropriated, as they said, by Lamb. The matter of the third cheque was more complex. This had reference to payment for gas supplied to Weybridge Railway Station; and, if proved, it was a particularly bad case, because to the system he had attempted to describe were added misleading entries in a book over which Lamb had absolute control, and which it was his duty to see was filled in correctly in every respect. At Lady-day, 1914, the meter-reader found there had been a consumption at Weybridge Station of 508,800 cubic feet, and in due course an account was sent to the Railway Company; the sum due for this amount of gas being £89 0s. 10d. The account was paid by a cheque which was endorsed by Lamb, and the Railway Company got a receipt which was signed by Lamb; so that he had a double opportunity of knowing that the Company had paid the amount named. The gas consumption that was entered in the meter ledger, however, was only 408,800 cubic feet—or 100,000 feet less than the correct amount; and the sum received was entered in the daily cash-book, not as £89 0s. 10d., but as £71 10s. 10d. Whoever put it in, must have known it was a wrong entry. Then, the account being short by £17 10s., the old process was gone through. The bank paying-in slip recorded the full £89 0s 10d., so that the difference of £17 10s. was set free from some other account to misappropriate, if Lamb chose to do it. It was quite obvious that practices of this kind, if indulged in, could not go on for ever without being found out. A day of reckoning must come; and it came in this way. Mr. Thomas Price, the Manager of the Company, had occasion to examine the ledgers; and he noticed that Clayton's account, among others, was not in credit, as it should have been, by the cheque to which reference had been made. Inquiries were set on foot; and as a result, Lamb, who was then Secretary of the Company, was asked to attend a Directors' meeting and give an explanation of the state in which the account was found. He did attend the meeting; but as probably the Jury would have gathered, if the facts alleged were capable of proof, no explanation was possible. No doubt it would be better to hear from the witnesses what the prisoner did say at the meeting. All he (Counsel) would remark of the statements was that, if the Jury believed them, they were of the very gravest import in this particular case. The Company, it should be added, were insured for the fidelity of their servants; and, in fact, they had been repaid a fractional part of the deficiency to which he had drawn attention.

Mr. *F. Clayton* (a Director of Messrs. Thomas Clayton, Limited, of Oldbury, who purchased tar from the Company), Mr. *A. E. Ingleby* (in the employ of Messrs. Charles Page and Co., of London, who bought sulphate of ammonia), and Mr. *Henry Lanham* (from the Accountant's Office, Waterloo Station) gave evidence as to receiving the invoices and sending on the cheques referred to by Counsel in his opening.

In cross-examination, Mr. Ingleby said, speaking not as an expert in handwriting, he thought the signatures of "Lamb" on the receipt and on the cheque were different.

Mr. *A. J. Brabner* (Manager of the Walton Branch of the London and South-Western Bank) having given evidence of the paying-in of the cheques referred to in the indictment,

Mr. *Thomas Price* (the Manager of the Company) was called. He stated that Ross occupied the position of Assistant-Secretary and Collector. There were two offices, an inner and an outer one. The two strong rooms and two safes were all in the outer office. So far as his knowledge went, Lamb and Ross had duplicate keys. There was in the outer office a clerk about 21 or 22 years of age. He had searched the daily cash book, and failed to find Clayton's cheque entered in it. The entries at the time the cheque was stated to have been received were all in the handwriting of Ross. Page's cheque, £99 7s. 4d., also was not entered; while the Railway Company's amount was wrongly entered.

Friday, July 23.

Mr. *Price*, in reply to further questions put to him by Mr. Moresby, stated that the book in which the cash summary was entered was, at any rate in the main, in Lamb's handwriting. Clayton's invoice was made out by an assistant in witness's office—Mr. Vanner. The Clayton cheque was endorsed, as to the signature, by Lamb; and the words "Walton and Weybridge Gas Company" were in Ross's writing. The paying-in slip was in the writing, he believed, of the junior clerk in Lamb's office—Sedgley. This included Clayton's cheque. Page's invoice was in Vanner's writing. The cheque was endorsed in the writing of Lamb; while the receipt was in the writing of Ross. The Weybridge Station account, which showed 508,800 cubic feet of gas, £89 0s. 10d. was made out by Ross. The cheque sent by the Company was endorsed by Lamb, who also signed the receipt, which was on the cheque. It was the duty of prisoner to see that the figures on the meter-reader's card were entered correctly in the meter ledger. The consumption shown in this book was, however, 408,800, and the sum due was based upon this figure, showing a deficiency of £17 10s. The meter ledger was kept partly by Ross and partly by Sedgley. Since these matters had cropped up, he had gone very carefully through the books, and there were deficiencies exceeding the £217 6s. referred to in the indictment. In September last he spoke to Ross, who made a certain statement in reply. Following this up, he saw Lamb, who, before witness said anything, exclaimed: "I am awfully sorry, Price. For God's sake do not say anything about this. I can raise £1000 in 24 hours, and put matters straight." Witness replied that it was a matter he must put before the Directors. This was done.

Mr. Wild (in cross-examination): Did you say before the Magistrates at Kingston that Lamb used to leave the work to be done by Ross and Sedgley? Did he not spend much time in the garden?

Witness: Yes; I agree.

Cross-examination continued: Ross was Assistant Secretary and Collector, and had been with the Company 22 years; while Sedgley had been there for six years. Weekly rough summaries on loose sheets made by Ross were asked for when the case was before the Magistrates. He did not then know of their existence; but on searching the office they were discovered.

Mr. Wild: Is the cash summary book—that is, Lamb's book—a copy of these weekly summary sheets?

Witness: The entries do appear to be copies.

The Recorder: Did you, when the case was before the Magistrates, appreciate the suggestion that the book for which Lamb was responsible was merely a copy of these loose weekly sheets which Ross made out?

Witness: I do now; but I did not then.

Mr. Wild: Can you find a single entry in the daily cash book in Lamb's writing which is false?

Witness: There is an omission on Aug. 6, 1913, of a cheque received then from the Weybridge Urban District Council, £145 2s. 3d. Ross was away on holiday at that time.

Cross-examination continued: In Clayton's case every entry was in Ross's handwriting, except the endorsement on the cheque. As to the Railway Company's case, the only writing of Lamb, again, was the receipt and endorsement on the back of the cheque. In Page's case, the receipt, which was separate from the cheque, was in Ross's writing. Ross's salary was £170 a year.

Mr. Wild: I suggest at the conversation referred to, Lamb said: "I am awfully sorry about this, Price. For God's sake try to get this hushed up for Ross's sake."

Witness: No.

Cross-examination resumed: The bank paying-in slip for Aug. 6, 1913, was, in his opinion, mainly in Sedgley's writing. The £145 2s. 3d. was in his writing. In the daily cash-book on that date some entries were made by Lamb and others by Sedgley, who was dismissed from the Company's employ with Lamb and Ross.

Re-examined: The receipt on the cheque from the Weybridge Council which had been referred to was by Lamb. The cheque was entered in the daily cash-book on Aug. 19, though the receipt was signed by Lamb on the 5th, and the cheque was paid into the bank on Aug. 6. He believed Lamb attended to his duties properly.

Mr. *W. A. Bilney*, J.P., a Director of the Company, said in September last year he attended an informal Board meeting at the Company's offices; there being also present Mr. Alfred Wood (the Chairman) and Mr. F. E. Elliott. Lamb came into the Board-room, and was asked for an explanation as to Messrs. Clayton's and Messrs. Warren's accounts. Before prisoner answered, witness cautioned him that he need not make any statements which might incriminate him. Lamb said: "I had those moneys; and I am very sorry for what I have done." The Chairman asked how much he had had, and Lamb replied about £300. It had been going on about eighteen months. "I had some speculations," continued Lamb, "on the Stock Exchange, and lost money by them. When I wanted any money, I used to ask Ross for it. He generally gave me £20 or £30 a month." Subsequently, Ross was interviewed. Lamb was at once suspended, and was asked to attend a full Board meeting the following day. On that occasion, the statements previously made were repeated; but Lamb then said he had had certainly not more than £500. The Company had fidelity guarantee policies of £1000 on Lamb, and £300 on Ross; and they had been paid the full amounts.

Cross-examined: The Auditors had not called his attention to any false entries by Lamb. Mr. Comyns Carr before the Magistrates raised the defence that this matter had been treated as a civil debt so far as Lamb was concerned.

The Recorder: That would be no defence to the criminal charge.

Mr. Wild: The defence is that this is a civil debt.

Cross-examined: No resolution to prosecute was passed on the 24th of September. The decision to prosecute was taken by resolution a month later. Objection was raised by the Company's Solicitor to the production of correspondence with the Guarantee Society, and to the answering by witness of a number of questions; and these objections were upheld by the Bench, with the result that Mr. Comyns Carr declined to proceed with his cross-examination. Lamb said nothing about paying doctor's bills at the first meeting. The question of discharging the prisoners was not discussed before the meeting on the 24th. He had no vindictiveness whatever against the men. Lamb did not say at the second meeting that he had had £300 from Ross, who told him the total deficiency was £500. Nothing was said at the meeting about Sedgley not being guaranteed. The Board did not agree by a majority to leave the whole question of prosecution in the hands of the Guarantee Society. He had not heard that some of the Directors called at the offices of the Guarantee Society before the resolution to prosecute was passed. After the meeting on Sept. 24, the Guarantee Society wrote asking that a life policy of Lamb's might be handed over; and this was done, after proper authority had been given. It had been stated that £500 had been paid over by Lamb to the Guarantee Society; but it was not true to say that the matter was ever regarded as a civil debt. Witness was then questioned at length regarding the circumstances which led to the transfer of the trial from the Kingston Quarter Sessions to the Central Criminal Court.

Re-examined: Neither witness nor the Company cared in the least where the trial took place. He had known Lamb for over twenty years, and never had an unfriendly word with him. So far as he knew, there was no delay whatever in undertaking the prosecution. The books had, of course, to be carefully gone through. There had been, so far as he knew, no suggestion on the part of the Guarantee Society that any portion of the amount paid by them to the Company was received from Lamb. The prosecution was undertaken by the Company as a public duty.

Mr. *Alfred Wood* (the Chairman of the Company) gave evidence as to the interviews with Lamb. Prisoner was asked what had become of the money; and he said: "I had it." Asked what he had done with it, he replied that he had been speculating on the Stock Exchange. Further, he said, the frauds extended to about £300. At the second interview Lamb was told that a certain account [not in the charge] had been paid, and that he had had it. Lamb said: "If Ross says so, I must have had it." He then said the frauds might be £500, but not more. The Company had at no time treated these sums as a civil debt owing by Lamb; and the Company had had no communication with the prisoner in regard to so treating it.

Cross-examined, witness denied that the subject of a prosecution was mentioned at either of the meetings. It was decided to have the books put in the Auditors' hands to see what was the state of affairs.

Mr. Wild: I suggest this matter was left in the hands of the Guarantee Society to settle?

Witness: I say, no.

Further examined: The matter of the Guarantee Society was left in the hands of Mr. Bilney, who saw the Secretary. The Directors, other than Mr. Bilney, had, so far as he knew, nothing to do with the Guarantee Society. He knew the Society had had £500 from Mr. and Mrs. Lamb.

Re-examined: His Company had nothing whatever to do with the arrangement for the Guarantee Society to take over Lamb's policy. Until that day, he had never heard it said that prisoner was "slack" in his duties.

Saturday, July 24.

Sergeant *Parrish*, stationed at Hersham, said he was on duty when Lamb surrendered last December. The warrant was read to him, and he said: "I am not guilty; I had better not say anything."

This concluded the case for the prosecution.

Mr. Wild submitted as a point of law that there was no evidence on the charge preferred, which was one of larceny. There was no charge of receiving; and there was no evidence whatever, on the uncontradicted statements of the prosecution, of any larceny.

The Recorder remarked that this must be for the Jury to say. It entirely depended upon whether or not the prisoner was an accessory before the fact.

Mr. Wild, proceeding then to address the Jury, said he was glad, from the point of view of the prisoner, that they would decide the case, not upon any technical point of law, but upon its merits. Upon his instructions, this was one of the most scandalous prosecutions ever preferred in a Court of Justice; and it was not until they got into the present Court that the defence had had an opportunity of developing it or of it being put forward properly. He (Counsel) was not there to say that Lamb had not been inattentive to his work; but he did suggest that he had not been guilty of any criminal act. In the book which formed the basis of this case, over the material dates, all the entries were in Ross's handwriting, and the omissions also were due to him. The summary sheets were also in Ross's writing; and these were copied by Lamb into the cash summary book. As to the documents put in, there was no handwriting of Lamb except by way of endorsement of cheques. Lamb had never taken a farthing of his employers' money; but unfortunately he had been buying stocks, and had also incurred heavy expense through his wife's illness, and so wanted money. Ross told him he had just got money from his wife; and he lent Lamb sums amounting to a total of £300, for which he handed over an endowment policy as security. On Sept. 23, Ross for the first time told Lamb he had defrauded his employers of £500, and that the £300 which Lamb had had came from this. Ross asked Lamb to try to get the matter hushed up, and he at once consented. The only sort of evidence against the prisoner was in connection with the Board-room meetings. Lamb stated then that Ross had told him about the money that he had had. Having inadvertently let Lamb into this awful difficulty, Ross was now prepared to tell the truth—that beyond this £300 the whole of the money had gone into his (Ross's) pocket. The Directors having talked over a prosecution, decided by a majority to leave the matter entirely in the hands of the Guarantee Society. Now, the defence was that the matter from the beginning was a civil debt. The fact that the people who ought to prosecute had so treated it, was strong evidence that it was a civil matter. Before themselves saying anything about a prosecution, the Company allowed the Society to deal with the matter; and the Society then tricked Lamb into paying over the £500—the prosecution being used as a lever against the unfortunate man in the dock and his wife. This money having somehow been scraped together, was handed over, and a receipt was given by the Society to the effect that it was received "in full settlement and discharge of all claims under this guarantee." If ever there were blackmailing letters written, those addressed by the Guarantee Society to Lamb deserved this term. Unless the Guarantee Society got this £500, it was open to them to raise the point that there had been no dishonesty, and so refuse to pay the £1000 to the Gas Company. Why should Lamb have paid over the money, unless he considered it was a civil matter? If the Society really believed Lamb had committed fraud, they had compounded a felony, and they should be in the dock with him. On Oct. 14, the receipt was given in full discharge by the Society; and on Oct. 22, having got their £1000 from the Society (£500 of which was Lamb's money), then "in the interests of the public," the Gas Company decided to prosecute. If ever there was a discreditable charge, it was this one. It was a wicked prosecution of this unhappy man. When the case in the first place came before the Bench at Kingston, the defence were prevented from putting forward their case. From the beginning, every obstacle was placed in the way of the defence; and now the Gas Company were afraid of being sued for malicious prosecution in the event of the prisoner's acquittal. The prosecution was one that never should have been brought.

Monday, July 26.

Thomas Henry Lamb, at the opening of the proceedings this morning, entered the witness-box, and was examined by Mr. Comyns Carr. He explained the position of the house on the works and the offices, and his duties as Secretary. The books he personally kept were the trade ledger, general ledger, minute books, shareholders register, and the stock and share registers—in addition to the cash summary book. It was no part of his duty to keep the daily cash-book. The meter-rental ledger, it was also Ross's duty to keep.

The RECORDER: As Secretary would it be your duty to check the books from time to time, particularly before the audit?

Witness: Yes.

Examination: Unfortunately he did not do so. He had not fulfilled his duties to the full in this respect during the last few years. The local Auditor, who went through Ross's books, came in frequently and looked over them. He never called witness's attention to any irregularity in Ross's books; and the same remark applied to the other Auditor, who was an accountant. The cheques that had been produced were endorsed by witness; and this was quite the usual practice. They were brought to him in batches from the office for this purpose. Page's receipt was signed in his (witness's) name by Ross. The loose cash was kept in one of the strong rooms, to which there were two keys, one of which was kept by Ross and the other by Sedgley. Of the strong room in which books were kept, witness had one key, and the other was kept in a drawer. Being in want of money, owing to Stock Exchange transactions and a serious illness of his wife, he asked Ross where he could raise some, and Ross said his wife had come into some money, and he thought he could arrange to lend witness what he wanted. He did, in fact, lend him several sums, on the security of an endowment policy. All this time he had no suspicion that Ross had not come by the money the way he said he did. He never had any part in, or knowledge of, the stealing of the sums referred to in the indictment or any other sums, or of any entries in or omissions from the books. The first he heard of the matter was on Sept. 23 from Ross, who said he was short of slot money, and took Clayton's cheque and others to pay the amount. The shortage, he stated, was £500; and the £300 witness had had came out of this. He asked witness whether he could repay the £300, and also whether he would try to get the matter hushed up. Price then came in, and witness did ask him; but he said nothing about raising £1000 in 24 hours. He then went on to state what took place at the interviews with the Directors. At neither interview did he admit that he was a party at any time to the felonies committed by Ross. He was not given any opportunity to properly explain matters. Witness bore out the statements made by Counsel as to the negotiations with the Guarantee Society.

At this stage, further argument arose as to securing the evidence of Mr. Sherwell, the Manager of the Guarantee Society. Counsel for the prosecution declined to call him; and Counsel for the defence also refused to put in the box a witness who, he said, "was the agent of the Gas Company." Several of the jurors, however, emphatically expressed the opinion that Mr. Sherwell's evidence would be of great interest, and that the prosecution should call him. The Recorder pointed out that he could not call him; and Mr. Sherwell could not appear unless he was called.

Mr. MORESBY said, as the defence would not call Mr. Sherwell, he would later on do so himself.

Further examined, witness said when he paid over the £500 to the Guarantee Society, he took it the matter was regarded as a civil debt, and that some moral responsibility rested on him as Secretary for the non-detection of Ross's frauds. Sherwell told him the Directors of the Gas Company had authorized him to say the payment of this amount would settle the matter.

At the conclusion of this part of the witness's cross-examination,

Dr. *Coram James* stated that he had known prisoner well for over seventeen years. He had looked upon him, and still did, as a person of the highest commercial integrity. He would still be prepared to trust him to any extent.

Lamb again entered the witness-box after the adjournment, and was cross examined by Mr. MORESBY. His association with the Directors was quite a pleasant one until these proceedings arose. So far as Mr. Price was concerned, he could not say the same. As superior officer, he had, of course, free access to all the books, as well as the strong-rooms and safes. He agreed that he was responsible for the supervision of Ross, as regarded the receipt of money. But though the books were there, he never examined them. Before signing the half-yearly balance-sheets he did not examine the bye-products ledger. When making up the June accounts in the year referred to, he did not notice that the Clayton and Page cheques had not been credited. He had had one or two investment dealings on the Stock Exchange before the occasion already referred to. He denied that he had had any dealings, direct or indirect, with bookmakers who were named in Court. At local race-meetings he had put small sums on horses.

Mr. MORESBY: Do you now justify having borrowed money of your subordinate, who was younger than you, and had a salary of £170?

Witness: I did not borrow from him, but from his wife.

Have you ever heard of a case in which one man has put his liberty in peril in order to provide for the needs of another?—No.

Do you believe Ross did that?—The £300 must have come from there.

The RECORDER: It is suggested that unless you had been dishonest there was no liability under the guarantee policy.

Mr. MORESBY: Did not the Society themselves threaten a prosecution for fraud? So that the whole object of your negotiations was to stave off this prosecution?

Witness: I suppose so.

Can you show me a single shred of writing, through the whole of the negotiations, to indicate that the Gas Company had anything to do with the matter?—No.

When you got a receipt from the Society for the £500, did you not recognize that, if it was to prevent all further proceedings on the part of anybody, it was vital to have the name of the Gas Company mentioned—which is not the case on the receipt?—I relied on the assurance of the Society that the payment would settle everything. The solicitor was present at the interview.

How came you to hand over £500, if your only fault was borrowing from Ross?—I was advised to do so; and I am sorry now I did so.

Re-examined: He had heard it stated that Ross's total defalcations amounted to some £1800; but the £300 was all he (witness) had ever had.

The Court sat late to hear further evidence; but the report of this part of the proceedings must be held over until next week.

WORK DELAYED BY RETORT-HOUSE FUMES.

Action against the Conway Corporation.

A dispute connected with the erection of four ventilators in the retort-house of the Conway Corporation Gas-Works occupied Mr. Justice Bailhache, sitting without a Jury, at Birmingham Assizes last Tuesday. The plaintiffs were Messrs. Ash and Lacy, Limited, makers of tanks and constructional ironwork, who sought to recover from the Conway Corporation £58 1s. alleged to have been lost through the men and plant employed on the work being idle for several hours daily in consequence of fumes said to come from the retort-house rendering work impossible.

Mr. E. W. CAVE, for plaintiffs, explained that the original claim was for £319 [the price of goods sold and work done under the contract], in addition to the £58 1s. Since the issue of the writ, however, defendants had paid into Court the sum agreed upon as the price of the work. The action was now confined to the damages for loss alleged to have been sustained by plaintiffs owing to the conduct of the defendants in putting difficulties in their way in carrying out the work. The contract was for the erection of four ventilation shafts in the roof of the retort-house of the Conway Corporation gas-works. The manufacturing operations caused fumes to arise inside the retort-house which were not only of a disagreeable, but of a dangerous, character. When the men came to erect the ventilators, they found that at intervals during the day the process of charging and discharging the retorts went on, and that the fumes escaped through the hole where the ventilators were to be put in. The result was that the workmen were suddenly exposed to the gas, and had to descend and take refuge on the ground until the operations were over. Counsel went on to say that 1548 hours' time was lost by the men owing to the fumes. It was an estimated figure, which, at 9d. an hour, gave the amount claimed. Defendants declined to pay the additional amount, but said they would pay the £319 on condition that they received a receipt in full discharge of their liability. This plaintiffs refused, and eventually defendants sent a cheque for £319, which plaintiffs returned.

His LORDSHIP asked whether it was not common knowledge that there would be fumes in a retort-house.

Mr. CAVE: But ought they to be expected to know that the process of making gas in this retort-house was of such a nature that the people engaged in putting in the ventilators would be affected by it?

His LORDSHIP: Is there anything peculiar in the way in which this Corporation make their gas? What do you put ventilators in the roof of a retort-house for except for getting rid of the fumes generated inside the retort-house? You might easily have stipulated that the retort-house should not be used.

Mr. GRAHAM, for the defendants, in reply to a question by his Lordship as to whether the £58 1s. was disputed, said it was a great deal too much. He thought it should be nothing; but on the assumption that it ought to be anything, he considered £14 was sufficient.

Mr. *W. I. Ash*, a Director of the plaintiff Company, said that when he sent in the tender for the work, he had no idea how many retort-houses there were, nor did he anticipate any difficulty in the men proceeding continuously with their work. No indication was given to him that this would be the case. He went down to Conway while the work was in progress and saw the Corporation engineer. He discussed the firing times with him, and was told that they were 6 a.m. to 6.30, 8 to 8.30, 10 to 10.30, 12 to 12.30 p.m., 2 to 2.30, 4 to 4.30, and 6 to 6.30—seven times a day, and half an hour each time. The work was begun on Aug. 4 and finished early in November. In estimating the amount of the tender he did not take into consideration at all any time which would be lost by the men having to come down from the roof when the fumes were rising, and getting back again.

In cross-examination, witness agreed that he knew the ventilators were being erected to carry away the fumes. He had heard that an injunction had been obtained against the Conway Corporation on account of the fumes from the retorts.

Mr. GRAHAM: The necessity for four ventilators on this short span of roof must indicate a considerable production of noxious gas?

Witness: The troubles of the Conway Corporation did not occupy our thoughts. The men lost three quarters of an hour each firing.

Mr. GRAHAM contended that the time lost was lost largely on account of the absence of tools and want of system by plaintiffs.

Mr. *L. F. Guttridge*, plaintiffs' Assistant-Manager, gave evidence as to a conversation he had with the Chairman of the Conway Gas Committee as to the fumes. He told that gentleman that the men could not work in the fumes, and he replied: "We will fire one end while your men are working at the other."

At the close of the case,

His LORDSHIP said he was against plaintiffs. He did not think they had any claim in law. Judgment would therefore be for defendants on the additional amount. Plaintiffs would have judgment for the £319 paid into Court.

Water Supply Rights at Birr (King's County).

The Master of the Rolls in the Irish High Court, Dublin, delivered judgment in a case in which the Birr (No. 1) Rural District Council were plaintiffs and the Birr Urban District Council defendants, relating to the water supply to the town of Birr. Both Councils are water authorities. Plaintiffs complained that defendants wrongfully entered their territory, laid mains, and secured contracts for the water supply to the military authorities, a laundry, and some private residences. Defendants said that, after full publication of statutory notices and the holding of a public inquiry, they laid the mains complained of with full knowledge, and without objection on the part of the plaintiffs. His Lordship said the real question at issue was whether plaintiffs had no rights to the lands on which the works were erected and the pipes laid; and the evidence showed beyond doubt that plaintiffs themselves consented to the supplying of the barracks by defendants. On this consent large expenditure was incurred. Plaintiffs had full power to consent, and, having done so, this disposed of the action.

MISCELLANEOUS NEWS.

EUROPEAN GAS COMPANY.

Gas Supply in France during the War.

The Annual General Meeting of the European Gas Company was held last Tuesday, at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. H. E. Jones in the chair.

The Secretary (Mr. W. B. Brady) read the notice convening the meeting, and then the annual report and the statement of accounts. The report was as follows :

The war has necessarily affected the Company's business to a considerable extent during the past financial year—some stations having suffered more severely than others. Thus at Amiens, which was for a short time in the occupation of the enemy, the reduction in the sale of gas has been serious. This has also been the case at Boulogne. But in other towns the falling-off has not been so marked ; and, moreover, the year under review had the benefit of four prosperous months before the outbreak of the war.

The Company's profits have been greatly reduced by the high rates of freight which have ruled since the war, notwithstanding that there was an improvement in the return from coke.

The accounts show that the year's profits are insufficient to provide for the payment of the usual dividend ; but the Directors, after full consideration, recommend that the difference necessary to meet such payment be taken from undivided profits, and that the same dividend as in previous years be paid—viz., 20s. per share, free of income-tax, towards which 10s. per share was paid on Feb. 1 last.

The average length of the Company's concessions is now 26 years.

The exceptional decline in the prices of all securities consequent on the war has still further brought down the Stock Exchange values of the investments held by the Company—to £46,162 below the amount at which they stand on the balance-sheet now before the shareholders. This difference is partly covered by the reserve of £12,219 for the depreciation of investments. It is unlikely, however, that the Company will be forced to realize any of the securities it now holds during the present financial crisis.

The efficiency of the manufacturing and distributing plant at the several stations has been fully maintained.

The Directors have to report with much regret the death of their former Chairman, Mr. Robert Hesketh Jones. Pursuant to the regulations of the Company they have filled up the vacancy, and have nominated C. C. Carpenter, Esq., M.Inst.C.E., D.Sc., as a Director, subject to confirmation by the shareholders at this meeting.

The Directors who retire by rotation are R. S. Gardiner, Esq., and A. T. Eastman, Esq. ; and the retiring Auditors are J. Reeson, Esq., and H. J. Luff, Esq., who, being eligible for re-election, offer themselves accordingly.

War, but Not an Unsatisfactory Account.

The Chairman said it became his duty to address the shareholders on the report and accounts for the past year. He thought they would agree with him that probably in the whole history of the Company they had never met under quite such extraordinary circumstances as that day, having regard to the fact that the country in which their works were all situated had been at war during the whole of the past twelve months. He did not suppose any of them, when they met this time last year, could have conceived that such an upheaval and overthrow of everything which they considered equitably and morally right, and in some respects politically right, could ever have taken place. The war, as they all too well knew, was going on. Perhaps the shareholders knew more of it than he did ; and it would therefore ill become him to waste their time in any reflections upon it of any kind whatever. In regard to the Company's own immediate history, he had to stand there—perhaps at the first since the war of the annual meetings of public companies—to give some account of what had happened during the twelve months that had elapsed. He ventured to think, however, that few chairmen would be able to meet their shareholders with a more satisfactory report in the circumstances than the Directors presented that day.

THE LATE CHAIRMAN AND THE NEW DIRECTOR.

Before dealing with any of the details of the year, it was his duty, and his inclination, to refer to the loss the Company had sustained by the death of Mr. R. Hesketh Jones, their former Chairman. The shareholders would have noticed that, for some little time before his death, Mr. Jones had allowed some of the work and responsibility to fall upon his (the Chairman's) shoulders. When their late friend had an accident in Paris some five years ago, he then felt that he would like to retire ; but he (the Chairman) was bound to say, when he got better, he listened to the representations of their Managing-Director (Mr. W. Williams) and himself, and came back to the Board. He even went further than that, though he at first demurred, and resumed his duties as Chairman. He should like to say that besides the loss of their late Chairman's great business perspicacity, his decease was a personal loss to his colleagues, and not more to the others than to himself. When he (the Chairman) first joined their direction, he had known Mr. Hesketh Jones by repute for a long time ; but they were comparatively strangers. He should like to acknowledge here the benevolent, kindly, and genial way in which the late Chairman always treated his colleagues, and him personally, because a technical director was not always the most agreeable personality to deal with. But they got on splendidly together. He recollected very well the almost affectionate passages there were between them when Mr. Hesketh Jones was most solicitous for the advancement of one of his (the Chairman's) own sons to a vacancy he (Mr. Hesketh Jones) was causing by retirement from another Board. The highest compliment the Directors could pay to their deceased friend was to replace the abilities that he brought to their counsels by selecting the best possible representative, the best possible gas administrator, and the most enlightened and cultivated (he would not say cultured, because that was a German term) engineer and gas manager in the kingdom. That was the gentleman whose election he should presently have to propose to the shareholders should be confirmed—Mr. Charles Carpenter, D.Sc., the eminent Chairman of the South Metropolitan Gas Company. He was a member of the High Explosives Committee, and was now doing distinguished service for the State ; and in many ways, and in every way, he was a great benefactor to the gas industry. He was sure the shareholders would support the action of the Board in this matter in the most cordial and unanimous fashion.

THE FULL DIVIDEND.

The next point he had to deal with was the dividend. Perhaps the shareholders were surprised when they learned that they were, under the circumstances of the times, to receive the full dividend. This was announced in the papers some time ago, because the Directors desired to alleviate any anxiety in this regard, and to prevent any shareholders dealing with their shares under any misapprehension. This was (if he might use a colloquialism) "a tall order" in a year when nearly every British gas company had raised the price of gas, and, by force of the sliding-scale, would have to announce to the shareholders a diminished dividend. The Directors did not arrive at the conclusion to do this, under all the circumstances—under all the anxieties and the duress in regard to material, labour, and other things—without great thought. But this was a year in which they all wanted all the income they could get ; and the Company had a number of French shareholders who had suffered more hardly than they had done here through the war, and by them, he was sure, the undiminished dividend would be gratefully received. He could not tell the shareholders that the dividend had been exactly earned during the year ; but the amount they had taken from their resources in order to give it to the shareholders was not considerable for a company in such happy circumstances as theirs. The shareholders had been told before, and they had just heard read, the amount of the investments in which the reserves of the Company had been placed, and the considerable sum that they ordinarily would realize. They were not exactly saleable just now at the full price ; but the Company had a small balance in a fund to meet any deficiency in value. This fund of about £12,000 was quite large enough (though the entire difference in the values that day was £46,000) when they bore in mind that three parts of the securities were repayable at par. But the Board thought that, with prudence, and short of some grievous calamity arising, there would not be any occasion to even consider the realization of the bulk of these investments.

FORESIGHT IN COAL STORAGE.

It was his pleasure generally, in addressing meetings of shareholders, to go into technical details ; but this was a Company where it was not desirable, for many reasons, to enter into the technical operations. The shareholders, however, could accept his assurance that the whole of the works were in first-rate order, and had been fully maintained. They might also accept his assurance that the working results throughout their stations were up to the standard of the past, and in some cases superior. The report told them that freights had gone very much against the Company ; and in regard to the price of coal, the outlook at one time was very serious. If, however, the results had been so good as to earn the shareholders their dividend, with the slight qualification he had indicated, this was due chiefly to two causes : First, the war did not break out until the Company had enjoyed four months of prosperity—perhaps the most prosperous time the Company had ever experienced. They had had the plant at their works reinforced, and put into the most economic condition. They had also renewed their contract for coal at a lower price ; and the four months promised a year of unexampled prosperity. But this was afterwards neutralized by the effects of the war. The rise in freights on coal, for instance, was so serious that the Directors had to make representations on the subject to the French authorities. They would have felt the circumstances in a much heavier degree had it not been for the extraordinary foresight, judgment, ability, and great energy displayed by their Managing Director, who had been careful, as he always had been, to keep a large stock of coal at the works. Owing to this, during the first few months of the hardship, this Company went free of coal trouble ; and when the Deputy-Chairman (Mr. R. S. Gardiner), who had extensive connections and relations with the gas companies in France, came back after a visit to several important places in France (where they were then actually almost without any coal worth speaking of in their stores), he was able to tell the Directors that, in passing some of their own works, he was amazed to see the splendid provision the Managing-Director had made. [Applause.] From the cheerful assent of the shareholders to his compliment, he was sure he would gratify them much more by telling them that the Board felt bound under the circumstances, when they realized the great danger of which Mr. Williams had relieved them, and what great prosperity he had brought to the Company by his foresight, to make an addition to his annual emoluments, which he considered adequate, and for which he expressed his obligation. [Hear, hear.] The Directors were certain the shareholders would feel towards Mr. Williams as they themselves did over the exercise of his ability and foresight, which meant so much to them.

RETICENCE, BUT GOOD ASSURANCE.

This, as he had said before, was especially a time for reticence, and, he would add, reticence on the shareholders' side in not asking him questions which he could only answer by telling them that he must be reticent. He had informed them that their works were in good order, and that the operations were good. He must ask them to accept this, as well as his assurance that the Board had not by any means drained the resources open to them, and which resources were under the control of a Board constituted of men like Mr. Chaloner Smith, who was expert in financial matters ; Mr. Carpenter, who was the head of one of the most important London Gas Companies ; Mr. Gardiner, who was an old hand at the administration of companies—especially Continental ; Mr. Eastman, who sat on another gas board ; and lastly himself (the Chairman). The shareholders might take it that, with such a Board, no risk was being run in paying the proposed dividend.

A NEW ERA FOR GAS—IMPORTANCE OF RESIDUAL PRODUCTS.

Generally upon the gas situation, he should like to say that, speaking broadly of the future position, gas had entered almost upon a new era. New things were being accomplished, and a new position was being acquired in the commercial world and in the political world. He had stated that Mr. Carpenter sat, and rightly, upon the very important High Explosives Committee of the War Office. In this connection, it would interest the shareholders to learn that the gas undertakings throughout Great Britain were now providing an explosive which formerly was ignored—an explosive of the very highest value —by a process which Mr. Carpenter introduced, and that this was being done on such an economical footing that they were able to tell the War Office that, neither in plant nor in service, would there be anything to pay for beyond the material itself, which passed through the hands of contractors to eliminate from the tar. Besides this, the times of stress in this country and in France last year taught people the value of coke as a fuel; and it taught them another lesson, which he had often been surprised was not recognized before—that was, the enforced production by gas undertakings of good fuel like coke independently, and without any primary aim at profit. Coke had to be produced, according to the sale of gas, whether they liked it or not. If people would not buy it, then gas-works would have to give it away. This element was one of the greatest securities to the poorest people, who were the largest users of this fuel, as well as to manufacturers who, he hoped, would be in the future greater users of it than of old. They obtained greater certainty in making a contract for coke instead of coal, for the retorts at gas-works near them would always be producing the material, and they would never have to go short. Then another of their products—sulphur—was becoming of increased value just now on account of the high price of sulphuric acid. He would only be wasting time if he went into the romance of all the hydrocarbons which their tar developed. But he might say that in every way the residual products of gas-works were going to be better known and be better understood and inure to the advantage of gas manufacturers to a degree that had never been recognized before.

THE PRICE OF GAS.

One other matter to which he wished to refer was the price of gas. The average price over the whole of their works was in round figures 4s. per 1000 cubic feet. This was a very low charge for France. The shareholders might depend upon it that the Company would always have a prosperous future so long as they maintained this position. It was a price which made gas easily available and useful as a fuel. Whether they be gas companies working under concessions as abroad, or whether they be companies working as at home under sliding-scales or maximum prices, there was no element that would so conduce to their permanent and definite security and prosperity as selling gas at a low price, as was accomplished in the towns of France which their own Company illuminated.

The Deputy-Chairman (Mr. R. S. Gardiner) seconded the motion, which was unanimously carried.

The Deputy-Chairman then moved the confirmation of the interim dividend of 10s. per share less 6d. per share in respect of the shares held in France, and the declaration of a final dividend for the year ended March 31 at the rate of 10s., free of income-tax, and subject to the deduction of French stamp and transfer duty of 6d. per share in respect of shares held in France.

The Chairman seconded the motion, which was unanimously carried.

Moved by the Chairman, and seconded by the Deputy-Chairman, Mr. Carpenter's election as a Director was heartily confirmed. Both speakers remarked upon the admiration which all entertained for the services of Mr. Carpenter to the gas industry, and upon the good fortune of the Company in having obtained his services, which had already proved of great advantage to the concern.

Mr. Carpenter thanked the shareholders very heartily for their endorsement of the honour bestowed upon him by the Board when they asked him to become a Director.

Proposed by the Chairman, and seconded by Mr. H. C. Smith, the Deputy-Chairman and Mr. A. T. Eastman were re-elected to their seats at the Board.

Moved by Mr. William Richards, and seconded by Mr. Bernard F. Harris, the Auditors (Messrs. J. Reeson and H. J. Luff) were re-appointed.

Loyal Working in France—Well-Deserved Recognition.

The Chairman asked the shareholders to express their thanks to their staff at home and abroad. At home they were so familiar with Mr. Brady and the competent members of the staff, that he need not say anything in their praise. Some of them were away by force of the war; so that they were short-handed in the office. But those remaining had done their official work with a zeal and an ability that left nothing to be desired. In France, some of their managers had been called to the Colours. Some of them had returned for the time being; and some had not yet been absolutely called up, but were daily expecting to be. Their operations for the Company were carried on in various parts of France; those who were in the North of France worked under some disadvantage and considerable danger. Bombs and shells fell not far from their works at Amiens; and they were lucky to have escaped destruction of their property. The works of the other Company in Amiens suffered some injury. German regiments had been twice through the town, so that the shareholders might imagine what sort of life their unfortunate managers had had there. All over France there was a shortage of men, difficulty in getting material, and anxiety about coal supplies. The shareholders could imagine that if these conditions made the Directors weary and anxious, how much more must they affect the men who were in daily danger, or at one time were in daily danger, of losing their homes and hearths. Through it all, their managers had worked steadily and well, and so had all the operatives, whom the Directors treated with every indulgence. They granted them everything which could conduce to their comfort. There were pension and sick funds, and things of that sort. Therefore he thought he might take credit for the Company for thoroughly caring for their operatives, who, on the other hand, replied by their industry and good service.

Mr. Carpenter said he was very pleased to have the opportunity of seconding this proposal. He knew something of the difficulties of carrying on a gas-works in ordinary times, but the difficulty of carrying on undertakings such as they had in different parts of France, under present circumstances, was great indeed. The difficulties with regard to materials and labour were important, and were felt in France as over here. But it was very remarkable how the returns from the different stations which came before the Board had been maintained under the stress produced by the shortage of material and with the labour they had. The latter they could not describe as indifferent, but it was different from the highest class of skilled labour which, under ordinary circumstances, a gas-works obtained. A great deal was due to their managers for the admirable manner in which they had carried on the works.

Mr. Williams thanked the shareholders on behalf of the staff in London and abroad. The past year, he remarked, had been a very strenuous one; and there did not appear to be any immediate prospect of things getting into normal condition. But the shareholders might depend upon the staffs at the different stations and in London doing the best they could for the interests of the Company.

Moved by Mr. J. Reeson, and seconded by Mr. J. H. Solomon, a cordial vote of thanks was passed to the Chairman and Directors.

GAS PRICES AT CARLISLE.

A Council Debate.

There was a lengthy debate in the Carlisle City Council, before the proposal of the Gas Committee to increase the price of gas from 2s. to 2s. 4d. per 1000 cubic feet to all consumers was agreed to—as briefly recorded in the last issue of the "Journal."

Mr. J. P. Buck (the Chairman of the Gas Committee), in proposing the resolution increasing the price, as from the 1st inst., said that when the Council sanctioned the reduction in the price of gas, to take effect from the beginning of 1914, some members had great misgivings as to the result of such a drastic change. The reduction then made was from 2s. 3d. to 2s. per 1000 cubic feet to the ordinary consumers, and 2s. 6d. to 2s. to prepayment meter users. At the same time, some of the charges to the outlying districts were lowered. This policy had been amply justified by events; and, in addition to this, the works had been managed through a very difficult time with great care and efficiency, which reflected considerable credit upon the Manager (Mr. E. G. Hutchinson). They had paid about £2000 less for coal and oil than a year ago, though they had sold nearly 10 million cubic feet more gas. Of course, coal and oil were bought more cheaply in June, 1914, than in 1913. After drawing attention to various other items, he said there was a sum of £360, which represented what had been paid to the officials and workers who were serving in the army. He felt sure no member of the Council would grudge what was paid to the men who had willingly given up their home life and comforts to join the forces defending the Empire. In spite of the various unforeseen difficulties, the total expenditure was £42,869, against a total in 1914 of £45,458—though they had sold 10 million cubic feet more gas. With such a saving on the expenditure side, one might have expected some better result than a gross profit of £4428, against £7791 the previous year. But the lowering of the price had caused a reduction in the receipts from gas of £2767; while residuals had proved extremely disappointing. Bearing in mind the obsolete nature of the carbonizing plant with which he had to deal, the Manager had ample reason to congratulate himself upon the results he had achieved. As to the rise in the price of gas which was now proposed, the Committee were faced with the fact that, presuming as much gas was required this year as last, coal would cost them £9000 more; while other increases made a total of £11,350 to be provided for. Taking into account additional receipts and economies anticipated, there was left a deficit of £6700 to be met. Now, 2s. 4d. per 1000 cubic feet, was a very low price, even in normal times; and he thought gas was cheaper than burning coal.

Mr. Lowthian opposed the motion, and moved as an amendment that the price of gas be increased 2d. per 1000 cubic feet. In past years, he said, the gas-works had helped the city more than they were ever likely to lose. The works had cost £150,000, and had been paid for, except some £13,000 at present outstanding, out of revenue; and the gas consumers, who included the poorest of the population, had had to bear their share. In addition to this, they had paid £200,000 to the relief of the rates. If the price had to be increased in bad years, he argued that it should be reduced in good years. They were all gratified to learn that there had been a record production and consumption of gas; and what had been done during the past year reflected great credit on the Gas Committee and the officials. What did this mean? The cost had been less on account of the increased production; and it was an absolute saving to the city and the consumers of gas. To do anything to prevent this would be a retrogressive step. It was fair to assume that the increase in consumption had been largely due to the reduced price. The proposal of the Committee must inevitably arrest this progress. The result would be, not increased, but reduced, consumption relatively, and consequently higher cost of production. But beside the business side of the question there was the moral side. Much energy had been shown in pushing the use of gas-cookers and gas-fires. People had taken cookers and fires on account of the reduced price—in fact, they had been induced to take them because of the cheap price of gas. Were they going now to say to these people: "We got you to take these things because gas was 2s. per 1000 cubic feet. Now we are going to put your price up to 2s. 4d. It will cost you considerable trouble to get out of it." If the Committee's resolution were carried, a great many gas-stoves would be returned to them; and they would again have to deal with the question of returned gas-stoves. He admitted that the situation was abnormal; but he thought an increase of 2d. would meet the circumstances. The working classes were prepared to pay what might reasonably be calculated to cover the increased cost; but if they were asked to do more, and provide money for the City Fund, and therefore for the relief of the rates in addition—in other words, to relieve the more wealthy at the expense of the poorest—they would not do it.

Mr. NICHOLSON, who later in the discussion supported the amendment, said he was afraid the majority of the Committee had fallen victims to the temptation of continuing to do as they had done in the past—get through the medium of the gas undertaking something in the nature of a contribution to the City Fund. This was not a proper time to continue the process. The gas undertaking had been little less than a gold mine to the citizens of Carlisle; and he hoped it might continue for many years to be productive. But in principle he was strongly opposed to working undertakings of this sort for what was not their proper function, or the primary object of their establishment, the reduction of the rates.

Mr. B. CARR said that the position seemed to be a very simple one. It had been clearly shown that if the price of gas was continued at 2s. per 1000 feet, the Corporation would be faced at the end of the year with a very serious deficit; and it appeared to be a simple business proposition that they should provide against this by increasing the price of gas accordingly. They had had it shown that even the suggested increase was not likely to meet the case. It surely would be unreasonable not to do as suggested, especially in view of the fact that they were living in uncertain times, and when they did not know what might happen in the course of a year. The probability was that at the end of next year things would be dearer.

Some other members having spoken, the CHAIRMAN replied, the amendment was rejected, and the recommendation of the Gas Committee was adopted.

The Gas-Works Accounts.

The City Treasurer (Mr. John Graham), in his abstract of the income and expenditure of the Council for the year to March 31 last, referring to the gas undertaking, says: The revenue from the sale of gas shows a reduction of £2514, due to the lowering of the price, which came into operation on Jan. 1, 1914. There is also a falling off to the extent of £3181 in the amount of income from residual products. On the expenditure side of the revenue account, decreases are shown under the heads of manufacture (£2472) and public lamps (£1062). The other heads of expenditure show increases as follows: Distribution, £464; rents, rates, &c., £43; management, £306; and various other items, £131. Under the head of management, the item allowances to workmen and officials serving with the army (£360) appears for the first time, and is in accordance with the resolution of the Council. The gross profit for the year is £4428, a reduction of £3363 compared with last year, when the amount of gross profit was £7791. After deduction of instalments of loans and interest and other charges shown in the profit and loss account, the profit remaining is £550.

Mr. Hutchinson's working statement shows that during the twelve months there were used 28,814 tons of coal and 148,389 gallons of oil. The total quantity of gas sold was 348,052,100 cubic feet; while 5,345,900 feet were used for the works and offices, and 20,782,000 feet were unaccounted for. The quantity of carburetted water gas made was 39,572,000 cubic feet.

EDINBURGH AND LEITH CORPORATIONS' GAS SUPPLY.

Accounts of the Department for 1914-15.

Mr. A. Canning Williams, the Treasurer of the Edinburgh and Leith Corporations' Gas Commissioners, on the 22nd ult. presented to the Finance and Law Committee his report on the accounts of the department for the twelve months ending May 15. It was duly passed by the Committee, and came up for confirmation at yesterday's meeting of the Commissioners.

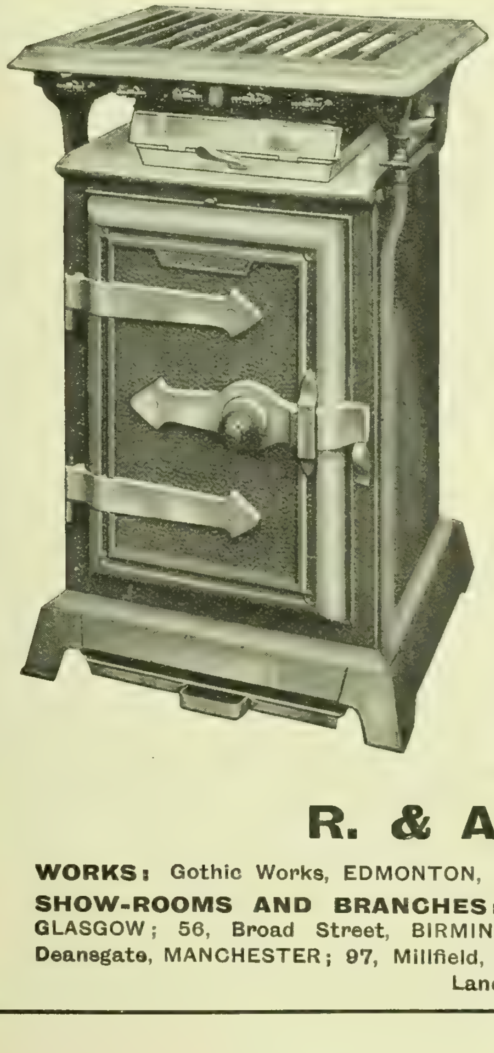
Mr. Williams stated that the gross profit was £85,350, which was £10,242 less than the amount estimated last September—the difference being due to a decrease in income of £8254, and an increase in expenditure of £1988. The charges against net revenue account, including a contribution to the special reserve fund of ⅞d. per 1000 cubic feet of gas sold, as was proposed in the adopted estimates, amounted to £101,874, or £16,524 in excess of the profit. Deducting from this sum the balance of accumulated surplus revenue brought from 1913-14—£6501—the net deficiency stands at £10,023 [which it has been decided to meet by a draft upon the general reserve fund]. If 2d. per 1000 cubic feet of gas sold had been contributed to the special reserve fund, as heretofore, Mr. Williams points out that the net deficiency would have been £19,343.

The following particulars explain how the difference of £10,242 between the estimated and the actual profit on the year's trading has been brought about:—

INCOME.

	Increases on Estimated Amount. £	Decreases on Estimated Amount. £
Gas		3,070*
Coke		6,055
Tar		3,401
Sulphate of ammonia	3,861	
Other items	411	
	£4,272	£12,526
Deduct increases		4,272
Decrease in income compared with estimate .		£8,254

[* Entirely due to restricted public lighting.]



The Main Advance.

THE introduction of the *New* Main Cooker marks a great advance in cooker construction. A salient feature is the treble-crowned oven packed with non-conductor which reduces loss of heat to a minimum. There are many other features which will interest you. Send for particulars or, better still, a sample, which will convince you.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N. Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

EXPENDITURE.

	Decreases on Estimated Amount. £	Increases on Estimated Amount. £
Fitting and maintaining cookers, fires, &c.		2,263
Rates and taxes		924*
War service allowances		1,410
Coal, oil, and coke used in manufacture of gas	2,532	
General establishment charges	610	
Bad debts	187	
Other items		720
	£3,329	£5,317
Deduct decreases		3,329
Increase in expenditure compared with estimate		£1,988
Decrease in income on estimated amount		£8,254
Increase in expenditure on estimated amount		1,988
Total		£10,242

[* Increase in rate of income-tax.]

SALE OF GAS.

During the year 1,988,328,500 cubic feet of gas were sold—the largest quantity in any year except 1913-14, when it was 30,913,200 cubic feet higher. If it had not been for the greatly restricted public lighting, due to military precautions, which effected a reduction of consumption by the public lamps of 31,971,800 cubic feet—a decrease of 38·29 per cent. on the previous year—there would have been a slight increase in the sale of gas.

The following table gives further details as to the sale of gas:

—	Year 1914-15.	Year 1913-14.	Increase (+) or Decrease (−).	—
	Cubic Feet.	Cubic Feet.	Cubic Feet.	Per Cent.
Ordinary consumers	1,649,077,700	1,660,947,700	− 11,870,000	− 0·71
Engines, &c.	120,411,500	114,411,600	+ 5,999,900	+ 5·24
Prepayment consumers	97,884,500	91,180,600	+ 6,703,900	+ 7·35
Stair lights	66,399,700	66,843,600	− 443,900	− 0·66
Public lamps	51,519,600	83,491,400	31,971,800	− 38·29
In bulk	3,035,500	2,366,800	+ 668,700	+ 28·25
Totals	1,988,328,500	2,019,241,700	− 30,913,200	− 1·53

INCOME AND EXPENDITURE COMPARED WITH 1913-14.

Dealing with the heads of income and expenditure for the year 1914-15, and comparing them with the year 1913-14, the following differences are shown.

INCOME.

	Amount for 1914-15.	Increase (+) or Decrease (−) on 1913-14.
Gas	£259,174	−£3,183
Coke	30,062	−7,094
Tar	15,269	−6,216
Sulphate of ammonia	23,371	−229
Rent of gas-fires, &c.	2,397	+661
Prepayment consumers (extra charge)	2,854	+186
Stair lights (maintenance, &c.)	4,582	−50
Other items	4,249	−149
Total income	£341,958	−£16,074

EXPENDITURE.

	Amount for 1914-15.	Increase (+) or Decrease (−) on 1913-14.
Coal	£118,350	−£13,044
Oil, &c., for carburetted water gas	3,003	+2,129
Wages (carbonizing)	12,159	−660
Salaries of engineers, works' staff, &c.	13,230	−36
Purification	716	−295
Repairs, &c., of works and plant	24,129	−2,095
Wages of gas-fitters, &c.	10,891	−646
Repairing mains, services, and meters	8,172	−760
Maintenance of stair lights	3,651	+5
Fitting and maintenance of cookers, fires, &c.	15,263	+288
Salaries—Treasurer and collectors' department, surveyors, &c.	13,326	−21
Establishment charges	4,490	−494
Rates, taxes, &c.	19,655	−2,932
Superannuation fund, national insurance, &c.	4,970	−81
War service allowances	4,010	+4,010
Bad debts	363	−172
Other items	229	+91
Total expenditure	£256,607	−£14,713
Charges for annuities, mortgage interest, &c., and contributions to the sinking and general reserve funds	£94,625	+£664
Contribution to special reserve fund ($\frac{7}{8}$d. per 1000 cubic feet of gas sold, as compared with 2d. in 1913-14)	7,249	−9,578
	£101,874	−£8,914
Balance between income and expenditure, being gross profit for the year	85,350	−1,361
Deficiency on year's working	£16,524	−£7,553
Deduct surplus revenue forward	6,501	

Net deficiency . . . . £10,023, leaving, in addition, £9320 due to the special reserve fund, to be made up in the period ending May 15, 1919.

"Carrying On"

Over **500** of our Works Employees are now absent on Military Service.

Of those who remain, many are engaged, directly or indirectly, in making Munitions of War.

Despite these heavy first claims, we can still execute your orders. Our stocks are ample, and our efficiency as an organization unimpaired.

The Gas Exhibition Salons,
60, Oxford Street, London, W.

THE DAVIS GAS STOVE

Capital Account and Redemption of Debt.

The following sums were last year charged to capital account: Railway waggons, £11,066; cookers and fires, £2068; new additional meters, £1330; new additional mains and services, £600—total £15,064. The amount received for the site, &c., of the old gas-works at Leith (£13,000) has been deducted from the capital expenditure—the net addition, therefore, for the year being only £2064.

Annuities and mortgages amounting to £36,754 were redeemed during the year, leaving the outstanding annuity and loan capital at £1,771,097, as compared with £1,806,175 at May 15, 1914. Included in the £36,754 is £19,654, the capitalized value of annuities purchased at a cost of £17,720, or £1934 below the compulsory purchase price.

General Reserve Fund.

This fund has been increased from £43,517 at May 15, 1914, to £46,106 at May last. It consists of compulsory contributions under the 1902 Act amounting, with interest, to £14,684, and voluntary contributions out of surplus profits in past years, with interest, £31,422.

CHARLOTTENBURG CORPORATION GAS-WORKS.

The Last Report Issued.

The report on the working of the Charlottenburg Corporation Gas-Works for the financial year 1913 was published in a recent number of the "Journal für Gasbeleuchtung."

The quantity of gas made in 1913 was 59,374,300 cubic metres (2097 million cubic feet), which was a decrease of 0·99 per cent. on the production in 1912. The result of this decrease was that the net profit of the undertaking for the year was 11·14 per cent. below the estimate. The chief causes of the decreased consumption were general stagnation in industry, and the prevalence of good bright weather extending into the winter months. The daytime consumption—from 6 o'clock in the morning till 6 o'clock in the evening—for the year showed an increase of 5·72 per cent. over the daytime consumption in 1912. The falling-off in consumption was only in the evening and night hours in the winter half of the year. There was a decrease of 1·69 per cent. in the consumption by private consumers, though the number of consumers increased by 5·30 per cent. The number of prepayment meters grew during the year from 20,337 to 23,071; but the mean consumption of gas per meter of this class exhibited a slight falling-off.

Of the total production of gas, 5·6 per cent. was coal gas produced at the No. 1 gas-works, 91·6 per cent. coal gas produced at the No. 2 gas-works, and 2·8 per cent. water gas, also produced at the latter works. The gas consumption was distributed as follows: Private consumers 86·28 per cent., municipal buildings 1·20 per cent., public lighting 7·86 per cent., works consumption 0·96 per cent., unaccounted for 3·70 per cent. Tests showed that the gas was well purified throughout the year, and had an average illuminating power of 13·41 candles, and a gross calorific value of 584 B.Th.U. per cubic foot at 60° Fahr., 30 inches, and saturated.

The dry coke had a mean calorific value of 12,082 B.Th.U. per pound. The tar sold was guaranteed not to contain more than 3 per cent. of water; and the guarantee was amply fulfilled. The sulphate of ammonia was sold as containing 25 per cent. of ammonia and less than 0·4 per cent. of free acid. Actually towards the end of the year it contained only 0·1 per cent. of free acid. The demand for better quality salt was therefore met without difficulty. Concentrated liquor was no longer in demand, owing to the appearance on the market of artificial ammonia; and the stock of concentrated liquor was worked up to sulphate.

STRATFORD-ON-AVON GAS UNDERTAKING.

At their meeting on Tuesday of last week, the Stratford Town Council had before them the question of the proposed loan in connection with the gas undertaking. The Chairman of the Gas Committee reported that he had visited the Local Government Board offices with the Town Clerk and the Gas Manager on the subject of the proposed loans; but that it was certain the Board would not now grant loans for the objects before them. The Chairman also reported that, although the Board would give no definite promise of a loan for the retorts after the war, he believed they would not refuse it, on the grounds that the work would then have been carried out. The Committee recommended the Council to agree with Messrs. W. C. Holmes and Co. to erect and finish the retorts and carry out the other necessary work "on the lines of the minutes of May 17, 1915." In the minutes referred to, the Gas Committee decided to approach the Local Government Board and endeavour to get them to promise their sanction for the proposed loan after the war if Messrs. Holmes would do the necessary work at once, and charge a rental until the loan was sanctioned.

Mr. Everard, in moving the adoption of the recommendation, said the instructions of the Local Government Board were pretty imperative that no loans could be granted. They tried very hard to get an undertaking that their action, if they went on building, should not prejudice an application later on. They did not elicit any refusal or statement that it would not be granted, but they could not get the officials to say that they might go on. The impression left on their minds was that it would not prejudice their application later on through having done work before getting the consent of the Board. Further, they learned that the Board would not lend money on the retorts for a longer period than fifteen years, although possibly they could get twenty years on some parts. The bulk of the Committee thought they were absolutely right in going on with the matter and coming to terms with Messrs. Holmes. His feeling was that the firm had met them quite fairly in the matter.

The recommendation was agreed to.

Perfect NOISELESS Combustion.

Pouring in an excessive quantity of grit.
It will be seen that the moment the hand has passed on to the next teat the flames become exactly as before.

WRIGHT'S PATENT
"THIMBLE"
GAS-FIRE
BURNER.

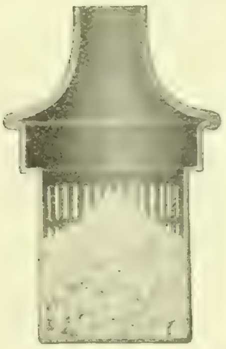
Adjustable for pressure.

Adjustable for calorific value, &c.

Non-luminous under all conditions.

These improvements are embodied in all our New Season's Fires without extra charge.

John Wright & Co.,
Essex Works,
Birmingham.



Sectional View of Patent "Thimble."
In actual test, even when the thimble was filled with grit up to the point shown in the above illustration, the full quantity of gas continued to pass, and the flame-quality was unimpaired.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

At Wednesday's meeting of the Dundee Gas Commission, the report made by Mr. Alex. Yuill [see *ante*, p. 146] in regard to the Broughty Ferry Gas-Works, was referred to. It will be remembered that when the estimates for the current year were considered, the lack of what was thought to be sufficient provision for depreciation in connection with the works, now superseded, was spoken of; and Mr. Yuill was asked to submit a report. Mr. Crichton said the report covered all the points raised by him, and was very satisfactory. It was a pity, however, that the information had not been supplied earlier. Mr. Noble, the Convener of the Gas Committee, agreed, and promised that next year he would institute a new procedure altogether. He was determined that the accounts would come before the Commissioners as a Gas Committee before the Finance Committee or the meeting of the Commissioners. Bailie Barnes considered the report a complete vindication of the action of the Manager in the preparation of the estimates. He associated himself with what Mr. Crichton had said—remarking that the members should have an opportunity of discussing the estimates at the proper time.

The price of gas is to be raised in Forfar by 5d. per 1000 cubic feet. The financial position was under consideration at a meeting of the Town Council on Wednesday, when Mr. Lamb, the Convener of the Gas Committee, stated that the expenditure for the current year was estimated at £12,691. The revenue from residual products would likely be £3494; and they estimated that with the price at 3s. 3d. per 1000 cubic feet they would derive an additional revenue of £9100. This showed an apparent deficit of £96; but they expected to have a balance of about £500 from last year. Satisfaction was expressed that Forfar was able to get off with such a small advance.

At Wednesday's annual meeting of the Montrose Gaslight Company, Mr. James Mitchell, the Manager of the works, reported that the gas made during the past year was 42,356,600 cubic feet - an increase of 1,085,400 cubic feet, or 2·63 per cent., over the previous year's make. The gas sold showed an increase of 4·05 per cent. on the quantity sold last year. The same dividend was declared as at the 1914 meeting; and the Chairman (Mr. A. Muirden) indicated that owing to a large advance in coal prices, and the anticipated reduced returns from residuals, the price of gas to consumers would eventually require to be raised in the town, as elsewhere.

The Hawick Gaslight Company are paying a dividend for the past year of 5 per cent. The price of gas is fixed at 3s. 2½d. per 1000 cubic feet—an increase of 11d. For the past year there had been the record make of gas of over 100 million cubic feet.

At a meeting of the Dundee Trades Council on Wednesday, the question of the price charged for gas consumed through penny-in-the-slot meters before April 30 last was discussed; and it was held that to charge on the new rate before it had been formally fixed by the Town Council was illegal. The matter was brought up by the Convener of the Local Affairs Committee, who read a letter from the Town Clerk, in which it was stated that he was of opinion that the increased rate should only apply to gas consumed after April 30. The Town Clerk further expressed the opinion that there should be no collection taken between April 30 and the date of the statutory meeting of the Gas Commissioners. The Convener said his reading of the Town Clerk's letter was that collections at the new rate were illegal before the statutory meeting had fixed the rate. The only just and legal thing the Council could do was to charge from May 1 to the next collection at the new rate, and from the previous collection to May 1 at the old rate. Mr. Ross pointed out that it was obvious that the Council had taken from the working classes who used penny-in-the-slot meters more than they were entitled to; and he moved that they claim a rebate on gas consumed before April 30. The motion was unanimously adopted; it being further agreed to ask all persons who had been overcharged to retain their receipts.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 26.

There have again been several inquiries in the market for pitch to be exported next season. With regard to creosote, it may be clearly said, for the information of tar producers, that for a long time past record prices have been obtained both for use in America and in this country. Freights paid on this article have been comparatively reasonable; and a few weeks ago it was reported that 4½d. net per gallon in bulk at makers' works London had been realized, while America continues to be an urgent buyer. Naphthalene and other materials for dye-making are in great demand. Average quotations are as follows (but some of the products having been requisitioned by the Crown authorities are not obtainable on the market): Benzol, 1s. 2d.; toluol, 3s. 4½d.; solvent naphtha, 2s., each net per gallon in bulk at makers' works; 60's crude carbolic acid, 3s. 6d. to 3s. 7½d. net, casks free; heavy oil, 4½d. to 4¾d. net and naked; creosote, 4¼d. net in bulk; anthracene, 40 to 50 per cent., 2¼d. net per unit packages free; pitch, 26s. net in bulk.

Sulphate of ammonia remains in a firm position, but sellers are scarce. The price is unaltered at £14 8s. 9d. net per ton, filled into buyer's bags at makers' works, for minimum 25 per cent. quality.

Tar Products in the Provinces.

July 26.

The markets for tar products have continued steady. In pitch, there is little or no business doing at the present moment. Freights are very uncertain, and therefore make transactions difficult. However, the

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majority of distillers are firm in their idea of value. Solvent and heavy naphthas are in good demand, and high prices are being paid. Creosote is quiet, and sales are reported at very reasonable figures.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 6d. to 25s. 6d. Pitch, East Coast, 22s. to 23s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. to 24s. Clyde. Benzol, 90 per cent., naked, North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3d. to 3 1/16d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 6d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *July* 24.

No change has taken place either in the tone of the market or in the value of this article during the past week. All near requirements have apparently been covered, and foreign buyers have been inclined to await further developments before making additional contracts, but, on the other hand, there has not been any pressure on the part of producers to effect sales. The closing quotations are still £14 13s. 9d. per ton f.o.b. Hull, £14 16s. 3d. f.o.b. Liverpool, and £15 1s. 3d. f.o.b. Leith. In the forward position little actual business has transpired, and the prices for October-March delivery remain £15 2s. 6d. f.o.b. Liverpool, and £15 5s. per ton f.o.b. Leith.

Nitrate of Soda.

The market for this material is also without alteration, and quotations are repeated at 12s. 3d. per cwt. for ordinary quality, and 12s. 6d. for refined, on spot.

Sulphate of Ammonia.

From another source it is stated that this market has remained firm during the past week, and further business is reported for delivery well into the next year. Outside London, makes are quoted at £13 15s.; Hull, £14 15s.; Liverpool, £14 17s. 6d.; Leith, £15; Middlesbrough, £14 15s.

◆

The Wombwell District Council have decided to charge a rent sufficient to cover the loss on capital outlay for meters and fittings to all consumers using gas solely as a stand-by for electric current. The Gas Committee have recommended the Council to become subscribers to the British Commercial Gas Association.

COAL TRADE REPORT.

Northern Coal Trade.

The northern coal trade is generally steady, though prospective legislation limits forward dealings. In the steam coal trade, the demand is good for the higher qualities, and a little stronger for secondary kinds. For best Northumbrians, 21s. to 21s. 6d. per ton f.o.b. is the current quotation; and for second-class steams, from 16s. 6d. to 17s. per ton. Steam smalls are in rather fuller demand. The prices, therefore, show a little ease, and are from 13s. to 14s. per ton. Production seems somewhat better; but the output is well taken up, and some collieries have fair forward contracts. In the gas coal trade, deliveries are heavy on long contracts, so that the bulk of the output is thus readily taken up—the home consumption being now better met than it was a few weeks ago. Best Durham gas coals are from 20s. to 20s. 6d. per ton f.o.b.; second-class sorts are about 16s. to 17s. per ton; and for "Wear Specials," 21s. per ton f.o.b. is quoted. There are no new contracts reported of late; and this is not surprising in the face of possible changes in price, and also in the shipment of coals to neutral countries. The freight market is quieter, and gas coals from the Tyne to London are now fixed at 7s. per ton or very slightly over. This rate seems likely at present to continue, though suitable vessels are in good demand for the coasting trades generally, and it will be remembered that deliveries on the old contracts must be soon expected to increase. Coke is steady. Gas coke is in general retaining the higher price recently gained. Good gas coke is quoted at 27s. to 28s. per ton f.o.b. in the Tyne.

◆

Mansfield Water Undertaking.—The annual report of the Water Committee, presented at a meeting of the Mansfield Town Council on Friday week, showed a total income for the year of £13,352, compared with £13,338 in the previous twelve months; the expenditure, apart from dividends, interest, and sinking fund, having been £5725, compared with £4934. The gross profit amounted to £7626, against £8403. After payment of interest, &c., there remained a net profit of £2498, of which £2000 has been applied in relief of the district rate; the remainder being placed to the reserve fund.

Belfast Water Supply.—A report on the subject of the water supply furnished to the City and District Water Commissioners stated that the additional storage works provided at Lough Mourne reservoir gives 127 million gallons; that the enlargement of South Woodburn reservoir will give an additional 90 million gallons; that Lough Shannagh gives an additional 80 million gallons, and that a further 12½ million gallons are being provided for—the whole yielding an increased storage since 1911 of 309½ million gallons. The Belfast Rural District Council have appointed a Committee to investigate, with Mr. W. D. R. Taggart, the alleged insufficiency of the water supply in the Carnmoney district, embracing an important residential area overlooking Belfast Lough.

Epoch —

A fixed point or period of time remarkable for some great event or series of events from which succeeding years, as connected therewith, are numbered; any remarkable date.

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Tottenham Light and Power Company.

The report of the Directors for the half year ended June 30, to be presented to the proprietors at the annual ordinary general meeting, to be held next Saturday week, states that the accounts for the six months show that, after providing for interest charges, there remains a profit balance of £14,610. Adding the amount brought forward from the previous half year, £25,561, the sum available for distribution is £40,171. The Directors recommend payment of the 5 per cent. per annum dividend on the preference stock, and of the full statutory dividends of 7½ per cent. per annum on the "A" stock and 6 per cent. per annum on the "B" stock, which will absorb £25,490 and leave £14,680 to be carried forward. The sales of gas showed an increase of 1½ per cent. over those of the corresponding six months of 1914. The consumers of the Company's gas now number 79,654, and the cooking and heating stoves in use are 57,169. In February last, £40,000 of the Company's "B" stock was offered for sale by tender, and realized an average price of £112 16s. 9d. To meet the greatly increased cost of coal, and the many extra charges which fall upon the Company in consequence of the war, the Directors have been obliged, with much regret, to increase the price of gas by 3d. per 1000 cubic feet, from the reading of the meters at Midsummer.

Gas Lighting at Lambeth.

The Lighting Committee of the Lambeth Borough Council have considered the accounts of the Gas Light and Coke Company, the South Metropolitan Gas Company, and the South Suburban Gas Company for public lighting during the quarter ended June 30 last, and have referred them to the Finance Committee for report and payment. The Gas Light and Coke Company's account totals to £528, from which amount the Company make an allowance of £21 in respect of gas not supplied in consequence of compliance with orders for diminishing the street lighting. The South Metropolitan Gas Company's account amounts to £2930, from which the Company have allowed, in respect of modified lighting, the sum of £897. The South Suburban Gas Company's account amounts to £190, from which a deduction of £27 is made by the Company for gas unconsumed as the result of the modification in street lighting. The Committee add that the accounts of the South Metropolitan Gas Company and the South Suburban Gas Company, exclusive of the deductions for modified lighting, have been increased by £405 and £20 respectively over the amount of the accounts for the corresponding period of last year, in consequence of the rise in the price of gas; but no such increase has been made by the Gas Light and Coke Company, owing to the fact that this Company's charges for the supply of gas are covered by the contract with the Council.

The Berwick and Tweedmouth Gas Company have agreed to a dividend of 8 per cent. (less income-tax), in place of the 10 per cent. to which the shareholders had become accustomed.

Darwen Gas and Water Accounts.

Mr. S. Crook, the Borough Treasurer of Darwen, has issued an abstract of the accounts of the Corporation, in the course of which he points out that the Gas Department has felt the results of the war in a large measure. The department commenced the year with an undivided profit of £5387; and on the framing of the estimates for the general district rate in the early part of the year, it was decided to transfer £1500 of these profits in aid of the general district rate. The result of the year's working was a loss of £2090, instead of a customary profit. They had made provision to the extent of £1584 for works supplanted on the erection of new gas apparatus, and on which the sinking fund contributions had not been completed. These items deducted, there remained only £212 of disposable profits to carry forward to the current year. Faced with the heavy increase in the price of coal, heavier sinking fund and interest charges in connection with the new plant, and increased prices of materials, the Gas Committee were reluctantly compelled to raise the price of gas. Mortgage indebtedness had been extinguished to the extent of £5700. In the Water Department, the rental receipts amounted to £12,752. The receipts for the previous year amounted to £12,715. The largest item on the expenditure side of the accounts was for water supplied by Bolton, £2847.

Hoylake and West Kirby Gas and Water Company.

The report of the Directors and the accounts for the year ending June 30 (which will be submitted at the thirty-eighth ordinary general meeting of the Company) show that the balance at the credit of profit and loss, after payment of the dividends and transfers to renewals and reserve funds, in respect of the year to June, 1914, is £1606, to which has to be added the net revenue for the past twelve months, £6681, and £1600 transferred from the gas contingency and plant renewal fund—making a total of £9887. Deducting the interim dividend paid in January (£2599), there is available a sum of £7288. From this, the Board recommend the payment of the following dividends: 6 per cent. on the "A" gas original capital; 4½ per cent. on the "B" gas additional capital; 6 per cent. on the "A" water original capital; and 4½ per cent. on the "B" water additional capital. These will absorb £3899, and leave a balance of £3389. After transferring £225 to the water contingency and plant renewal fund, there is left £3163 to carry forward. The dividend scheme, together with the interim dividend paid in January, represents a total distribution, less income-tax, for the year of 10 and 7 per cent. on the "A" and "B" capitals respectively. The quantity of gas supplied last year to private consumers and to the public lamps was 67,447,000 cubic feet. The price of gas during the period under review was 3s. 4d. per 1000 cubic feet, less varying discounts; while the charge to users of prepayment meters was 4s. 2d.

Half-yearly dividends at the rate of 5 per cent. per annum on the preference shares and £7 7s. per annum on the ordinary shares are being paid by the Annfield Plain and District Gas Company.

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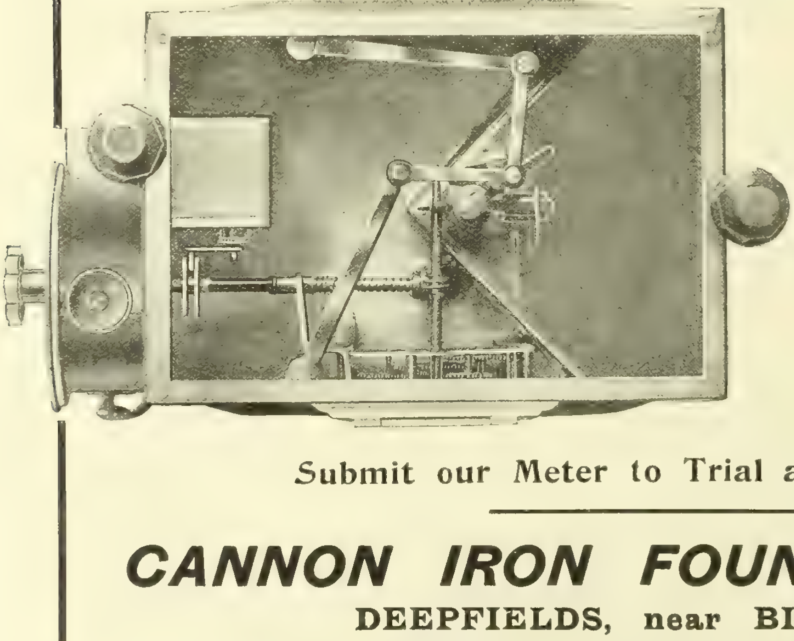

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Morecambe Price to Remain Unchanged.—The year's accounts of the Morecambe Gas Department show a credit balance of £1096, as compared with £1344 last year. Of this amount, £684 will be spent in renewals, and £412 placed to the relief of the rates. There has been an increase in the production of gas of 5 million cubic feet. The Gas Committee do not contemplate increasing the price.

John Russell and Co., Limited.—A Company has been registered, with a capital of £200,500 in £1 shares, 150,000 of which are 6 per cent. preference shares, to take over the business of John Russell and Co., Limited (incorporated in 1876), to carry on the business of tube manufacturers, factors, and merchants, coalmasters, ironmasters, dealers in gas, steam, locomotive, hydraulic, metallic, and other tubes, gas and other fittings, chandeliers, gaseliers, and other articles, &c., and to adopt an agreement with the old Company.

Oldham Street-Box Explosions.—In view of recent explosions in Oldham streets, owing to the proximity of gas and electric mains at certain points, a scheme has been proposed for placing the gas-pipes and electric cables farther apart. To obtain an idea of the cost, it is suggested that a length of 40 or 50 yards be taken up and altered. The cost of the work will then be allocated between the two departments. The Gas Committee, when the matter was brought before them, felt that for the public safety the work would have to be done, and authorized the experiment. The Electricity Committee subsequently gave instructions for the drawing-up of a report, and, if thought advisable, for the alteration of a short length of cable, so as to get an estimate of the cost.

Ashton-in-Makerfield Manager Complimented.—At the last meeting of the Ashton-in-Makerfield District Council, it was reported by the Gas and Lighting Committee that, in face of greatly increased expenditure, they were able to recommend that the price of gas remain unchanged. The value of this to the consumer, said Mr. J. Roberts, would easily be realized, when it was pointed out that the price of coal had doubled since 1911-12. Though the price of other materials also had increased since that time, they had had a steadily growing profit; and for the year ending March last the profit was the largest ever made. All credit was due to their Manager (Mr. H. Burton), for his wise and practical suggestions in the present crisis, and for the satisfactory condition of his department.

No Increase in Price at Colwyn Bay.—Alluding to the minutes of the Lighting Committee at the monthly meeting of the Colwyn Bay Urban District Council, which showed that on the past year's working there was a deficiency of £37, Mr. Gamble pointed out that various items which might have been allocated to capital account had been charged to revenue. Otherwise, there would have been a profit. The Committee did not propose to make any increase in the price of gas, though coal for the present year was costing 6s. a ton more than it did last year. Mr. G. Bevan (Chairman of the Finance Committee) congratulated Mr. Gamble upon the statement, and said they were looking forward to the time when the increasing revenues of the Gas Department would ease the burdens of the "poor ratepayer."

Bland Light Syndicate, Limited.—At the Board meeting of the Syndicate held on the 16th inst., it was decided to declare an interim dividend at the rate of 6 per cent. per annum, as last year. The Chairman (Mr. F. J. Gould) said he was very pleased to report that, although the turnover was slightly decreased, economies had been effected which enabled them to maintain the net profit, and there was every prospect of a satisfactory year.

Synthetic Chemicals, Limited.—This is the title of a Company which has been registered with a nominal capital of £2500, in 2100 "A" and 400 "B" shares of £1 each. The objects are to manufacture dyes, including coal-tar dyes, and chemical substances of all kinds, and to adopt an agreement between W. G. Wilkins, A. J. Walker, P. E. Bowles, Oliver Wilkins and Co., Limited, and T. S. Jones (for the Company). The Company is a private one.

Charges for Reinstating Pavements.—Consequent upon the enhanced price of materials, such as cement, the Metropolitan Water Board have intimated to the Stepney Borough Council that they are prepared to allow an increase of 10 per cent. on the existing schedule of charges for the reinstatement of trenches opened by the Board within the borough—such increase to take effect from April 1 last. In view of the possibility of a further increase in the price of materials, the Council have deemed it advisable to limit the proposed agreement to six months; and the Water Board have been so informed.

Chislehurst Street Lighting.—The Works Committee of the Chislehurst Urban District Council do not consider that any useful purpose would be gained by turning out the street-lamps at an earlier hour than usual. In this connection, the Committee reported, at a meeting of the Council last week, that they had considered a communication suggesting the total extinction of the street-lamps; but having regard to the opinion expressed by the Admiralty (who have made numerous investigations on the subject), that such a course is most undesirable, they had come to the conclusion that it would be more satisfactory to continue the reduced lighting till further directions were issued by the proper authorities. The report was adopted.

Street Lighting at Northampton.—The Northampton Highways Committee have received a letter from the Gas Company regarding public lighting during the continuance of the war. The Company point out that owing to the restricted lighting brought about (some 700 lamps are not now lighted, but still require a certain amount of maintenance), and to the fact that the number of lamps at present in use only allows of the reduction of their staff by four lamp-lighters, the cost per lamp has been greatly increased. They are, however, prepared to continue their contract during the period of the war at the rate of £2 15s. 4d. per annum per ordinary lamp; these figures being based on the present price of gas and the number of hours of lighting. Should the price of gas be increased, the calculations are to be made on the consumption, and charged at such increase (less 10 per cent. discount). The Committee have decided to recommend the Council to accept the Company's offer, which they state will effect a saving at the rate of about £2575 per annum on the terms of the old contract.

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Gas-Meter Thefts in Ireland.—In the Dublin Northern Police Court, John Patterson was sent for trial at the City Commission on charges of burglariously entering houses in Leeson Park, and stealing money from, and damaging, a gas-meter. Inspector Bergin, of the Alliance and Dublin Consumers' Gas Company, stated that in all 7s. 3d. was taken, and that the damage done amounted to 9s. The Belfast Magistrates sentenced John M'Millan to two months' imprisonment for stealing 1s. 3d. from a Corporation gas-meter in a house in Ewart's Row, and for maliciously damaging the meter.

Glass from Denmark.—The issue of "The Times" for Friday last contained a letter on the above subject from Mr. Charles D. White, in which he says: A few days ago, being in immediate need of a lamp chimney, I was forced personally to go into the village to buy it. On the glass of the chimney I read: "Made in Denmark." I said to the shopkeeper: "Do you think that chimney was made in Denmark?" To this he replied that he had his suspicions, that he had handled German chimneys before the war, and that this one was in every respect identical with the German ones. He produced a German chimney—the only one he had left of his ante-war stock. The two chimneys were, in fact, identical, except for the word "Saxony" on the one and "Denmark" on the other; and even in this they were alike, as these words were stamped on the very same part of the glass, within a circle of precisely the same size, on both chimneys. Inside the circles the words were distributed so exactly in the same manner that it was evident the word "Denmark" had been substituted for the word "Saxony" in the die or instrument used for stamping the chimneys. Having lived in Denmark, knowing fairly its industries, never before having seen a Danish-made lamp chimney—so far as I can recall, not even in Denmark itself—and observing such perfect identity in the two chimneys, I am of the opinion that Germany is by this alteration of label securing an outlet for this article of export. The ironmonger quite agreed with me in this opinion. Can you, or anyone, prove to me that my conjecture is incorrect?

Nuneaton's New Water-Mains.—The Nuneaton Town Council have had before them a letter from the Local Government Board, with reference to an application for a loan of £2000 for the purpose of laying new water-mains, stating that at the present time money could not be sanctioned for this kind of work, unless it could be shown that it directly affected the public health or was for war purposes. The Council decided to adjourn the matter for three months.

Water Supply of Oldham.—New filtration works, erected at a cost of £20,000, and estimated to give an additional 90 million gallons of water annually to Oldham, were formally opened at Castleshaw last week by Alderman Greaves (the Chairman of the Water Committee). The scheme will permit the use of a quantity of flood water now allowed to run to waste. The plant is capable of filtering 140,000 gallons per hour, or a total of 3,360,000 gallons a day, and when working at its fullest capacity will filter 122 gallons per hour per square foot of filter.

The Bradford Corporation Gas Committee have appointed a Special Sub-Committee with power to renew any of the existing contracts for gas coal at prices in accordance with those to be permitted under the impending Act of Parliament, and to consider and make recommendations as to tenders to be obtained for the annual supplies of coal, &c.

Early in April, a labourer (65 years of age) at the Dukinfield Corporation Gas-Works, slipped while emptying a barrow-load of oxide into a purifier, and fell with his head against the side of the box. This caused a wound on the temple, which was dressed, and the man was sent to the hospital, where he remained a month, and then became an out-patient. On the 6th inst. he died; and a postmortem examination showed that death was due to natural causes, and was not in any way accelerated by the injury sustained at the gas-works. The Coroner observed that if there had not been this postmortem examination, it might have been said that death was owing to the accident.

GAS COMPANIES IN THE STOCK EXCHANGE.

The general position of affairs on the Stock Exchange last week was much the same as the week before; but the paucity of business was even more pronounced. The tone, however, was more gratifying. After a rather dull opening day, the feeling slowly but steadily improved; and before the conclusion of business on Friday (for the Exchange was closed on Saturday), the prevailing disposition was one of cheerfulness. The old War Loan made an appreciable recovery, in response to inquiries by buyers, and Home Rails improved in view of the cessation of the South Wales strike—an advance which was maintained later on when a batch of railway dividends were announced, nearly all of which came up to expectations. The allotments of new War Loan paid-up in full on Tuesday reached a huge figure. Some had expected that, with the closing of the Bank of England list of subscribers, dealings in the loan would be at once authorized. But, seeing the unworkability of this so long as the Post Offices remained open to applicants, the postponement of dealings became a necessity. Business in the Gas Market was quieter than ever, even after making allowance for a five-day week. The small array of prices marked showed no change from the week before. The first announcements of companies' figures for the half year ending June 30 have appeared. The Gas Light and Coke Company will pay the full statutory dividend at the rate of £4 4s. per cent., and will carry forward a balance higher by £50,000 than that of six months ago. The Tottenham District Company will pay full statutory dividends of 7½ and 6 per cent.—as last year. The Newcastle Company will pay an interim dividend of 4¼ per cent. The Money Market was strong and active by reason of War Loan requirements, and discount rates generally were firm.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 80, 80½, 81, Lea Bridge 95, South Metropolitan 83, ditto debenture 59, 59½, 60, Tottenham "B" 103½, 104. On Tuesday, Alliance and Dublin 62, South Metropolitan 83, South Suburban debenture 90. On Wednesday, Bombay 5 7/32, Gas Light ordinary 80, 80½, ditto preference 71, South Metropolitan 82½, 83, 83¼, 83½, South Suburban debenture 90½. On Thursday, European 12½, Gas Light ordinary 80¾, 81¼, South Metropolitan 82¼, 82½, 84. On Friday, Commercial 4 per cent. 91½, European 12⅜, 12½, Gas Light ordinary 80½, 81.

Bank rate (fixed Aug. 8), 5 per cent.; last year, 3 per cent.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING JULY 24.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	62
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7½	Bombay, Ltd.	5⅞—6⅜	5 17 8	5 7/32
50,000	10	Feb. 26	16	Bournemouth Gas and Water 10 p.c.	29—30	5 6 8	..
373,480	10	,,	7	B 7 p.c.	15—15½	4 10 4	..
95,000	10	,,	6	Pref. 6 p.c.	13½—14	4 5 9	..
—	—	—	—	Deb.	..	—	..
380,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
330,000	,,	,,	11	Do. New	204—209	5 5 3	..
50,000	,,	,,	5	Do. 5 p.c. Pref.	109—111	4 10 1	..
206,250	,,	June 11	4	Do. 4 p.c. Deb.	91—93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	,,	,,	8	Do. A Ord. Stk.	154—159	5 0 8	..
530,000	20	Mar. 26	12½	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	Do. 4½ p.c. Pref.	4—6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	91½
560,000	,,	,,	5⅓	Do. 3½ p.c. do.	103—105	5 1 6	..
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	..
800 000	Stk.	,,	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	,,	,,	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	Derby Con. Stk.	123—125	4 16 0	..
55,000	,,	—	4	Do. Deb. Stk.	102—104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd.	17½—18	5 11 1	12⅜—12½
16,362,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke 4 p.c. Ord.	98—102	4 15 6	80—81¼
2,600,000	,,	,,	3½	3½ p.c. max.	76—79	4 8 7	..
4,062,235	,,	,,	4	4 p.c. Con. Pref.	96—99	4 0 10	71
4,674,850	,,	June 11	3	3 p.c. Con. Deb.	72½—74½	4 0 6	..
130,000	,,	,,	10	10 p.c. Bonds	..	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16¼—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c.	..	—	..
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C	151—154	5 2 4	..
65,780	,,	,,	6⅛†	Do. B	115—118	5 8 0	..
65,500	,,	June 26	4	Do. 4 p.c. Deb.	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental	150—160	5 12 6	..
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119—121	5 7 5	95
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. A	211—213	4 13 11	..
718,100	,,	,,	7	B	146—14	4 14 7	
306,083	,,	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	—
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd.	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	98½—99½	4 10 6	..
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	..
300,000	Stk.	May 14	8	Oriental, Ltd.	117—122	6 11 2	..
60,000	5	Mar. 26	10	Ottoman, Ltd.	7¼—7¾	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B	128—131	4 19 8	..
100,000	50	,,	12	Do. C	118—121	4 19 2	..
52,000	50	,,	10	Do. D	..	—	..
249,980	5	April 29	8	Primitiva Ord.	5½—6	6 13 4	..
499,960	5	June 26	5	,, 5 p.c. Pref.	4¾—5	5 0 0	..
521,600	100	June 2	4	,, 4 p.c. Deb.	91—93	4 6 0	..
—	—	—	—	,, ,, ,, 1911	..	—	..
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 3	..
209,984	,,	,,	10	Do. B	222—224	4 9 3	..
523,500	,,	,,	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African	10½—11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	82¼—84
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	59—60
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 6	..
60,000	,,	,,	5	Do. 5 p.c. Pref.	110—112	4 9 3	..
—	—	—	—	Do. West Kent.	..	—	..
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	90—90½
629,740	Stk.	May 14	5	Southampton Ord.	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c.	135—138	5 8 8	..
742,275	,,	,,	6†	B 3½ p.c.	115—117	5 2 7	103¼—104
181,255	,,	June 26	4	4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	,,	,,	6⅞	,, B 3½ p.c.	129—134	5 2 7	..
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110—115	5 2 0	..
352,000	,,	,,	6⅛	Wimbledon 5 p.c.	117—122	5 0 5	..
98,000	,,	,,	6⅝	Epsom 5 p.c.	121—126	5 5 2	..
88,416	,,	June 26	3	3 p.c. Deb. Stk.	66—69	4 6 11	..

The Manchester Gas Committee have purchased a special vehicle to deliver gas fires and cookers, which uses coke as fuel, instead of petrol.

At a Huddersfield auction sale, £436 of stock in the Longwood and Slaithwaite Gas Company was recently disposed of at the rate of £96 10s. per cent.

During a discussion by the Cardiff Water Committee on the need for economy in consumption on the part of the public, Mr. Jenkins remarked that the people they wanted to get at were those who poured out tons of water to produce a "fancy cabbage or a sprout." What he called them was "mad gardeners."

About 572 members of the Gas-Workers and General Labourers' Union were affected by the South Wales coal strike last week. The Executive have since authorized a distribution of lock-out pay at the rate of 1s. 8d. per day to all who had been idle more than two days.

One of the two main pipes which convey water from the reservoirs at Elan Valley, Rhayader, to Birmingham, burst near Knighton, in the early hours of last Saturday week. The accident occurred near the drive gates to Stanage Castle, and at a point where the main runs parallel with the Knighton-Ludlow main road. Tons of soil were moved, and the water rushed on to the main road, damaging the surface some distance, and eventually finding its way to the River Teme.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Meter Inspector and Slot Collector. No. 6071.

Plant, &c. (Second-Hand), for Sale.

Scrap Metal. Harrogate Gas Company.

Meetings.

Brentford Gas Company. St. Ermin's Hotel, Westminster. Aug. 6. 2.30 o'clock.

Colne Valley Water Company. Offices, New Bushey. Aug. 10. Two o'clock.

Gas Light and Coke Company. Chief Office. Aug. 6. Twelve o'clock.

South Suburban Gas Company. De Keyser's Hotel. Aug. 13. Three o'clock.

TENDERS FOR

Coal.

Haverfordwest Corporation. Tenders by Aug. 16.

Haverhill Urban District Council. Tenders by Aug. 10.

Tar.

Cleator Moor Urban District Council. Tenders by Aug. 20.

Mansfield Gas Department. Tenders by Aug. 4.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

BANK HOLIDAY.

In consequence of the BANK HOLIDAY, Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office

NOT LATER than the FIRST POST ON SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to
Walter King, 11, Bolt Court, Fleet Street, London, E.C.

Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
Palmerston House,
Old Broad Street, London, E.C.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
Andrew Stephenson, 171, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

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DRY METERS
TRY
JAMES MILNE AND SON, LIMITED.

SEND your inquiries for Carburetted HYDROGEN AND BLUE WATER-GAS PLANT, also TAR DEHYDRATING PLANT and other GAS-WORKS APPARATUS to—
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39, Victoria Street, Westminster, S.W.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS.
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Telegrams: "Dacolight London." Telephone: 2336 Holborn.

ENQUIRIES SOLICITED.
FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS.
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DONNINGTON, NEWPORT, SALOP.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, Oldham, and 45 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
Repairs receive prompt attention.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"Braddock, Oldham," and "Metrique, Lamb London."

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PREPAYMENT METERS
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SULPHURIC ACID.
SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED.
Works: Oldbury, Wednesbury, and Stafford.
Address Correspondence and Inquiries to Oldbury, Worcs.
Telegrams: "Chemicals, Oldbury."

HUTCHINSON BROTHERS, Ltd.,
Falcon Works, Barnsley.
Manufacturers of
GAS METERS (Ordinary and Prepayment),
"FALCON" INVERTED LAMPS and SQUARE LANTERNS for Street Lighting,
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Telephone: 1588 Avenue (3 lines).

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Tins for sale to Consumers.
In Bulk for Works Use.
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STREET LAMPS AND AUTOMATIC CONTROLLERS.
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SPENCER'S PATENT HURDLE GRIDS.
THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, May 11, p. 314.

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SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
Joseph Taylor and Co., Central Plumbing Works, Bolton.
Telegrams: "Saturators Bolton." Telephone 0848.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every Description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, Rose Mount Ironworks, Elland.

FOR

ALL METERS

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PATENTS AND TRADE MARKS PUBLICATIONS: "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

TAR WANTED.

JOSEPH A. HUTCHISON, LIMITED,
Highbridge Wharf, SOMERSET.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

TAR WANTED.

THE Burnden Tar Company (Bolton), Ld.
Hulton Chemical Works, BOLTON.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

Firth Blakeley, Sons, and Company, Limited, Church Fenton, near Leeds.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.

It is also used for the Enrichment of Gas.

Manufactured and Supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agents, F. J. Nicol & Co., Pilgrim House, Newcastle-on-Tyne.

Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

RICHARDSON'S

"PLUTONIC" FIRE CEMENT.

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For Gas Retort and Furnace Repairs, &c.
(42nd Year of Sale).
Prices and Samples free on Application.
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Telegrams: "Plutonic, Birmingham."
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"PENLITE"—The smallest efficient Torch on the Market. Exact reproduction of a Fountain Pen, with Clip for Vest Pocket. Nickel Plated 3s. 6d., Refills 1s., post free.

Starlite Company, 79, Wiltshire Road, Brixton, London, S.W.

"FRANCO," a wonderful new Process, Semi-Dry Battery for Pocket Flash Lamps. Guaranteed 5 Hours' Light. Standard size 9s. per doz. Try a Sample. Our list of Pocket Lamps, Torches, &c., now ready.

Starlite Company, 79, Wiltshire Road, Brixton, London, S.W.

ROCHESTER, CHATHAM, AND GILLINGHAM GAS COMPANY.

APPLICANTS for the Post of Assistant SUPERINTENDENT for the Gillingham Station of the above Company are THANKED and Informed that THE VACANCY IS NOW FILLED.

METER Inspector and Slot Collector Wanted for a Gas-Works in the East of Scotland.

Apply, by letter, stating Wage required, to No. 6071, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED—Good, Clean, and Hard CARBON, in Four Ton Lots, or more, f.o.r.

Address, No. 6072, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

STEAM-ENGINES and Exhausters COMBINED—120,000 per Hour Capacity. Seen Running by Appointment. £150 each to effect Immediate Sale. Guaranteed Working Order.

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CONDENSERS.—One set of Four Annular. Nearly new and Perfect. 10-inch Bye-Pass complete. £100 on Rails to save Removal home.

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PURIFIERS.—Set of Four 10 feet Square. Centre Valve and Connections. All Good. Delivered on Rails for £200 Cash, or Refixed if required.

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GASHOLDER, very strong, nearly new, 250,000 Capacity. Removing solely on account of Defective Tank. Will sell per Ton ready for Erection, or Quote Delivered and Erected. New Steel Tank if required.

Address No. 6070, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

SCRAP METAL FOR SALE.

THE Harrogate Gas Company have FOR SALE a large quantity of SCRAP METAL, and invite Quotations.

For Particulars, apply to the undersigned, or to the Engineer at the Gas-Works, Ripon Road, Harrogate.

H. Wilkinson,
Secretary and General Manager.
Gas Office, James Street,
Harrogate.

THE Cleator Moor Urban District Council invite OFFERS for the Surplus TAR produced at their Gas-Works during the Year ending Aug. 31, 1916.

Endorsed Tenders to be Delivered to the undersigned on or before Aug. 20, 1915.

Henry Rothery,
Clerk to the Council.
Public Offices, Cleator Moor,
July 20, 1915.

MANSFIELD CORPORATION.
(Gas Department.)

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the Sale of the Surplus TAR for the ensuing Twelve Months.

Tenders to be sent not later than 10 a.m. on Wednesday, the 4th of August, endorsed "Tender for Tar," to J. Harrop White, Esq., Town Clerk, Mansfield.

Any further Particulars may be obtained from the undersigned.

W. J. Rendell Baker,
Engineer and Manager.
July 22, 1915.

CORPORATION OF HAVERFORDWEST.

COAL.

TENDERS are invited for the Supply of about 1600 Tons of Double Screened GAS COAL of the Very Best Quality, to be Delivered at the Haverfordwest Railway Station, or at the Gas-Works Quay, Haverfordwest, by Water Communication, in Quantities as required by the Gas Manager during the Year commencing on the 1st of September next for the Corporation of Haverfordwest.

Tenders by Aug. 16.

Forms of Tender and further Particulars of
R. T. P. Williams,
Town Clerk.
Haverfordwest, July 27, 1915.

HAVERHILL URBAN DISTRICT COUNCIL.

TENDERS FOR COAL.

THE Haverhill Urban District Council invite TENDERS for the Supply of 800, 1400, or 2000 Tons of Best GAS COAL (Screened or Unscreened), to be Delivered free at the Haverhill (Great Eastern Railway) Station in such Quantities and at such Periods as may be ordered from time to time between the 1st day of September next and the 31st day of August, 1916.

No Form of Tender is provided, nor will be supplied.

The Council reserve the right to divide the Contract as they think fit, and do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Gas," to be Delivered to me on or before the 10th of August, 1915.

James Beasley,
Clerk.
Haverhill, Suffolk,
July 24, 1915.

THE GAS LIGHT AND COKE COMPANY.

NOTICE is Hereby Given that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office, on Friday, the 6th day of August next, at Twelve o'clock (noon) precisely, to transact the usual Business, including the Declaration of a Dividend for the Half Year ending on the 30th day of June last.

By order,
Henry Rayner,
Secretary.
Chief Office, Horseferry Road,
Westminster, S.W., July 19, 1915.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors of this Company will be held at the De Keyser's Royal Hotel, Victoria Embankment, London, E.C., on Friday, the 13th day of August, 1915, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended June 30 last; to declare a Dividend for the same period; and for General Purposes.

Dated this 20th day of July, 1915.

The TRANSFER BOOKS WILL BE CLOSED from the 30th of July to the 13th of August, both days inclusive.

By order of the Board,
Wilfrid Wastell,
Secretary.
Offices and Works,
Lower Sydenham, S.E.,
July 20, 1915.

BRENTFORD GAS COMPANY.

NOTICE is Hereby Given that a Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors will be held at the St. Ermin's Hotel, Caxton Street, Westminster, on Friday, the 6th of August next, at Half-past Two o'clock precisely, to Transact the usual Business, including the Declaration of a Dividend for the Half Year ending the 30th day of June last.

By order,
John T. Croxford,
Secretary.
Office, Brentford,
July 22, 1915.

COLNE VALLEY WATER COMPANY.

NOTICE is Hereby Given that the EIGHTY-THIRD HALF-YEARLY GENERAL MEETING of the Proprietors of the Company will be held at the Company's Offices, New Bushey, Watford, on Tuesday, Aug. 10, 1915, at Two o'clock p.m. precisely to consider the Directors' Report; to declare a Dividend; and to transact the Ordinary Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 28th of July to the 10th of August, both days inclusive.

Dated this 16th day of July, 1915.

C. P. Sinclair,
Secretary and General Manager.
New Bushey, Watford.

EUROPEAN GAS COMPANY, LIMITED.

SHARE WARRANTS TO BEARER.

NOTICE is Hereby Given that, in accordance with a Resolution passed at the Annual General Meeting of Shareholders held on the 20th inst., a DIVIDEND of 10s. per share WILL BE PAYABLE, on and after the 31st inst., on the above Shares, subject, however, to a deduction of 6d. per Share for French Stamp and Transfer Duty.

Payment will be made at the Union of London and Smith's Bank, Limited, 2, Princes Street, London, E.C., after Serial Coupon No. 81 has been left Three Clear Days for Examination.

W. B. Brady,
Secretary.
Finsbury House, Blomfield Street,
London, E.C., July 20, 1915.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. Richards, at 37, Walbrook, E.C.

THOMAS TURTON

AND SONS, LIMITED,

SHEAF WORKS, **SHEFFIELD,**

MANUFACTURERS OF

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London Office:

90, CANNON STREET, E.C.

JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXXI., No. 2725.] TUESDAY, AUGUST 3, 1915. [67TH YEAR.

EDITORIAL NOTES.

Administration and Results under War Conditions.

THE administration of gas undertakings, it is safe to say, has never been put to greater strain and test than in these present times. Everything is abnormal; and everything demands, from those who direct, the closest inspection and the most circumspect action. The questions involved in buying and selling alone are a weighty responsibility; and nothing that directors or committees can do can obliterate, though there may be a lightening of, the effects of the unusual conditions. In the case of companies, consumers and stockholders alike have to share the burdens of increased costs—increased in relation to the business done—which are to be found in every place in the accounts of a gas undertaking in these vastly disturbed and critical days. Not only buying and selling, but the matter of the policy best befitting the times is of extreme importance, as bearing on the financial issues of the trading. Any muddled policy in management just now may make the burdens for gas consumers and proprietors immensely heavier. Take the Gas Light and Coke Company (whose accounts are before us for review) with, in magnitude, an incomparable coal-gas producing plant, and an extensive carburetted water-gas plant. Coal is dear; but the lower pithead priced coal contracted for prior to the war has been carbonized during the past half year. Freights have been high. But they have come down somewhat; and the Company are now, through the action of the Board, provided to larger extent with carrying capacity of their own. Coal in the current half year will be dearer; but the cost of bringing it to London will be easier than the average of the past six months. It is to the advantage of the Company that some of the cheaper coal should overlap well into the current half year, when dearer coal will also have to be used. Then oil has been, and is, cheaper under contracts entered into before the war. Examining all these things in their proper relationship, together with the fact of sluggish coal deliveries during the half year, administrative policy suggested that the production of carburetted water gas should be increased and coal gas reduced. But a critical point was how far this should be done, in view of the excellence of the coke market, and the good prices realizable for coke, sulphate of ammonia, and chemical products. With a smaller quantity of coal carbonized, the output of bye-products has naturally been reduced; and in this circumstance, despite good prices, the income from this source has considerably diminished.

For these various reasons, and owing to the abnormal conditions prevailing, the difficulties of the managerial policy for all gas concerns—and to the extreme for the largest Gas Company—have been intense, and the matter of determination highly responsible. Just two or three figures indicate the character of the anxieties for the Directors. Although the coal carbonized last half year amounted to only 736,696 tons, the total quantity received in the six months only reached 780,574 tons, compared with 906,910 tons in the corresponding half of 1914, which half commenced with 265,692 tons in store, as against only 138,839 tons in January last. June, 1914, ended with 232,764 tons in store; June last with only 181,300 tons. Things are now improving in respect of storage. The figures, however, speak of the anxious time of the half year; but, being totals, they do not tell of the days and the weeks when the Directors—especially the Governor (Sir Corbet Woodall), the General Manager (Mr. D. Milne Watson), and the Chief Engineer (Mr. Thomas Goulden) were filled with concern over supplies.

It must be confessed that there is very little utility in comparing the results of the working of the Company in the half year preceding the war with a half year completely under war conditions. But if there is not much utility, there is interest. That the increase of 6d. in the price of gas since the war started is justified is proved by the accounts, by the new coal contracts, by the reduced business owing to public lighting restrictions and general economy, by the fresh demands upon revenue, and by the fact that the reduced business has made very little (if any) impression upon the general expenditure. With the 6d. difference in price, the smaller business of the half year has given (after providing for fixed charges, and putting by £5000 to the redemption fund, as against £15,000 in the first half of 1914) a profit of £395,050, or £75,573 more than in the first half of 1914. But the balance brought into the corresponding half of 1914 was £614,052, as against £384,538 last half year, or a difference of £229,514—there having previously been serious inroads into the carry-forward, with a view to maintaining the price of gas at as low a figure as possible. The total amount available for distribution is therefore £779,588, compared with £933,530 a year ago, or less by £153,942. The proprietors suffer with the consumers by receiving a dividend at the rate per annum of only £4 4s. per cent., or 13s. 4d. per cent. less per annum than preceding the war. For the half year, therefore, the proprietors only divide £343,501, or less by £54,663 than for the six months preceding the war. Although the sum to be carried into the accounts for the current half year (£436,058) is more than was brought into last half year, it is £99,256 less than the balance forward at June last year. The Directors were wise in raising the price of gas sufficiently to prevent (unless unforeseen circumstances arise) a further shrinkage of the protective and equalizing carry-foward.

The advance of price is one point in administrative policy that has found complete warrant in the result. Another is the increased transfer from coal gas to carburetted water gas, which has helped to minimize the effects of the higher cost of materials. The total make of gas in the half year was 14,411,622,000 cubic feet, or a reduction, compared with the June half of 1914, of 1,000,002,000 cubic feet. But the quantity of coal gas made was reduced by 1,992,272,000 cubic feet, so that, in order to counterbalance production with demand, 992,270,000 cubic feet more carburetted water gas were manufactured. The smaller business done and the larger change-over to carburetted water gas resulted in these working figures: Of the total gas made, 9,609,352,000 cubic feet were coal gas, and 4,802,270,000 cubic feet were carburetted water gas. The quantity of coal carbonized was 736,696 tons, compared with 938,104 tons, or a diminution of 201,408 tons. On the other hand, the amount of oil used rose from 8,619,000 gallons in the June half of 1914 to 11,675,747 gallons last half year—an increase of 3,056,747 gallons. But the tonnage of coal used would have been considerably more had not the make of gas per ton ascended to 13,043 cubic feet, as compared with 12,367 cubic feet in the June half of last year. The increase of 676 cubic feet from each of the 736,696 tons of coal carbonized represents a total of no less than 498,006,496 cubic feet. This has a considerable bearing upon the financial outcome; and the carbonizing department deserves credit for having assisted so well in the relief of the situation.

Though the quantity of coal carbonized was 201,408 tons less, the delivered cost of it—£713,214—was only £75,188 lower than in the June half of last year. The expenditure upon oil, however, went up by £20,825 to £101,235, and for coke and breeze by £15,803 to £67,384. The three items for manufacturing materials total to £881,833, as against £920,393—a reduction of £38,560, produced by the smaller business, the higher make per ton of coal, and wise administration. But deducting the receipts for residuals from the bill for manufacturing materials tells another tale. The net cost of materials, instead of showing a reduction, has gone up by £72,059, as compared with the net cost in the June half of 1914, when 1000 million cubic feet more gas were made! The sum received for residuals in the past half year was £439,448, compared with £550,067 in the first half of last year; so that the relative net cost of manufacturing materials was £442,385, as against £370,326, and this lower figure with the much larger business. The effect of this is that, whereas the cost of manufacturing materials in the first half of last year was 1s. 2·33d. per 1000 cubic feet of gas made, and only 0·35d. higher last half year (or 1s. 2·68d.), deducting residuals the comparative net costs per 1000 cubic feet were 5·76d. and 7·36d., or 1·6d. higher for last six months. It will have been observed that the difference in the receipts for residuals is £110,619. Coke (of which at June 30, only 11,658 tons were in store, as compared with 114,705 tons twelve months previously) produced £254,980, which was a decline of £56,026; breeze, in yielding £31,512, gave an increase of £8282; tar and tar products by returning £71,093, supplied £30,300 less; and ammoniacal liquor and sulphate of ammonia by producing £81,862, yielded less by £32,576.

The recession in the sales of gas in the December half of 1914 (which included five months of war) was continued in the past six months. But the whole of the December half year did not feel the full force of the lighting restrictions; last half year did. In the second half of 1914, the reduction in consumption was equal to 4·75 per cent. contrasted with the corresponding period of 1913. Last half year the reduction was 4·31 per cent., compared with the half year preceding the war, in which tbe increase of consumption was equal to 1·88 per cent. In the first half of last year, 14,059,454,000 cubic feet of gas were sold; last half year the sales amounted to 13,453,753,000 cubic feet, or a decline of 605,701,000 cubic feet, of which public lighting accounted for 182,434,000 cubic feet and shop and domestic consumption for 423,267,000 cubic feet. Through the increase of 6d. in price, the smaller private business brought in £143,367 more—viz., £1,805,640, compared with £1,662,273. Public lamps, on the other hand, only yielded £49,103, or £12,577 less. The receipts from residuals have already been dealt with. Including rents receivable and transfer fees, the total income last half year was £2,539,224—being an increase of £21,916. The total expenditure, amounting to £1,909,184, was less than in the first half of 1914 by £69,249. This, of course, was largely brought about by the lower outlay on manufacturing materials, wages, purification, and repair and maintenance of works, the aggregate of which savings is £54,745—the total expenditure under the head of manufacture being £1,239,151. Under distribution, the expenditure was £352,339, or £9665 less. The constituent items show somewhat normal swayings up and down; and the figures indicate that the Board have not allowed the extraordinary conditions to interfere with their established policy of a high standard of upkeep and depreciation. Very few other expenditure items are worth note. The employee co-partners suffer in harmony with the ordinary proprietors in respect of their bonus and dividends on their stockholding. For the year (not half year) ending June last, the total bonus charge was £29,953, compared with £45,653 in the June half of 1914. In the past six months, £1050 has been spent in connection with the quinquennial revaluations; bad debts have gone up by about £2000; there is a charge of £7135 for employees on active service, of whom there are about 2200. Reductions are also seen in the entries for workmen's compensation and the Company's contribution under the National Insurance Act. Thus we arrive at the excellent reduction of expenditure of £69,249, which, with the £21,916 increase in the income, gives the £91,165 by which the amount transferred to net revenue account a year ago is raised on this occasion to £630,039.

The half year has been full of strain and anxiety; but there is some satisfaction in believing that we have, balancing one thing against another, now arrived at (if the expression may be used in these times) settled gas circumstances in the midst of the world-wide chaos.

The Scientific-Industrial Renaissance.

A NEW and wideawake England is to be, or it is hoped will be, one result of the terrific and sanguinary war in which we are engaged. It is a sad and self-accusing reflection that it should have required a war that has caused the upheaval of the whole world's affairs to have suggested to this country, and to cause it, to shake off old trammels, and endeavour to make the best use of itself to the end of a greater national fruitfulness and prosperity. Beyond the passing reflection, however, the less the retrospect concerning this matter, the better. The more profitable lines of thought on which to indulge now that the awakening has come are as to how to develop on the great foundation which our natural conditions provide. Some short while since, the then President of the Board of Education, the Right Hon. J. A. Pease, M.P., informed the country of the scheme in embryo for promoting scientific and industrial research, with at the head of it a Committee of the Privy Council and a small Advisory Council constituted of men with some special qualification. Among other things that have dawned upon the country and its political government is that, up to the present, insufficient has been done in the United Kingdom in systematic development by the organized co-operation of the most talented brains—brains competent for the purpose through specialization. Another thing that has had greater comprehension is that no one body can possibly do all that we now appreciate there is to be done; and that there must be devolution of work if there is to be an opulent result. Specialization and the greatest efficiency go together; and the concentration of the brains of a number of picked men upon one particular branch of work—different Committees being engaged on different branches—will carry the nation and industries farther than otherwise would be possible, and produce the richest harvest of effect. The war started with Government departments pursuing the old formularies of peace times; and red-tapeism continued to detrimentally assert itself. Had these conditions continued, they would have had their proper reward in great national disaster. Fortunately, however, intelligence came to the rescue, but only by the impelling force of very perilous circumstances; and Committees were appointed to undertake special organizing service. Offhand, there can be named the High Explosives Committee, the Munitions Department (with District Committees), the War Inventions Board, and the Dyestuffs Committee, from which has issued "British Dyes Limited," with a Scientific Advisory Council. Now there is the Industrial and Scientific Research Committee and Advisory Council. There is the Coal Exports (Regulation) Committee; there have been the Coal Prices Committee, the Coal Mining Organization Committee, and the Parliamentary Coal Committee. Various other Committees have also been appointed, all with prescribed and useful work. These Committees mean greater efficiency, and the promotion of greater national good. If the life of the greater number of them only coincides with the duration of the war, the influence of their work will be felt far beyond it. There ought now to be another Committee in order to relieve the Board of Trade of the duty of seeing that the provisions of the Coal Prices Regulation Act (passed last week) are properly administered.

But the Industrial and Scientific Committee and Advisory Council are the new bodies which claim present notice, and the best wishes of the nation for a prosperous career, because they provide new and permanent, State-aided machinery for the promotion and organization of scientific research, with application to trade and industry, and the results of which research are to be for the national benefit, and not for the exclusive profit of individuals, companies, or industries. Though the need of a scheme of the kind has long been apparent to individual thinkers and to observers of the trend of affairs in this and other countries, and has been spasmodically advocated by such men, there has simply been, by the only effective political powers in such a matter, an appearance of a good-natured respect for the views, while there was a latent feeling that these views had nothing but academical birth, and little that was practical about them. Inaction was the consequence; and all that has been done has been, on the comparatively small scale, through individual initiative. The vicious idea that men of commerce and industry have the monopoly of practical ideas, and that from the scientific mind there is a complete alienation of that which is practical has had too large a sway. But the war has been the means of shattering such a silly notion. Soon after war broke out, our deficiencies were seriously brought home to a country previously largely contented with its own merits; and the aforetime disbelievers were forced to acknowledge that our shortness of various products, and our inability to promptly produce them, were due to the fact that, as a memorandum issued by the new President of the Board of Education (Mr. Arthur Henderson) neatly puts it, abroad—Germany particularly—"science has been "more thoroughly and effectively applied to the solution of "scientific problems bearing on trade and industry, to the "elaboration of economical and improved processes of manu-"facture." Face to face with such a precarious situation leaves this country wholly stranded for argument to prove that it has hitherto been in the right, and our rivals abroad wrong in their process for securing industrial and commercial advancement, and therefore greater national prosperity. Although loth to take example by our enemies, we should simply be our own chief enemies if we did not make the utmost use of what we realize now that the scales have been so effectively removed from our eyes. The Board of Education, in taking the lead in this matter, have done the correct thing in setting about the immediate organization on proper lines of industrial and scientific research, because to leave this work till hostilities have ceased would be suicidal. Time would be lost, as well as the advance in the work which it is possible to make while the war continues.

We are glad to see that, through their Advisory Council, the Industrial and Scientific Research Committee are proposing to make use of existing institutions (with the Royal Society at the head) in formulating schemes of research work. Most industries have their own central organizations; and no better bodies could submit suggestions as to the proper lines to develop the scientific study of problems affecting particular industries and trades. There has already been some experience in this direction in connection with most industries; and there will no doubt be a great deal of rivalry in trying to convince the Advisory Council that the best interests of the country will be served by pursuing at once the line which each one suggests. All cannot be in the first running; pressing national interests must have the preference. The Advisory Council will consequently have to exercise a very judicial and circumspect control. But there is fair confidence that the claims of the gas and allied industries will not be considered of second-rate importance. The part that the gas industry takes in supplying essentials to the chemical industry, to the works engaged in the provision of dye stuffs and colours, and to the factories employed on the production of munitions of war, and the large part that it takes in preserving coal from crude consumption, thus preserving to the country the valuable products of its carbonization, are not by any means negligible factors in the country's prosperity. On the contrary, they are all essential to the promotion of industry and commerce, and therefore of the national well-being. The Institution of Gas Engineers, the Society of British Gas Industries, as also the chemists and physicists specially identified with the gas industry, could provide a representative Sub-Committee to put before the Advisory Council for Industrial Research a good and comprehensive scheme for research. Proposals for work will not only be acceptable from institutions, but also from individuals. The scheme, in fact, contemplates the broadest field within which to cultivate interest and co-operation, and to mature result; and this is the correct course. It is easy to see that, if the work is conducted on the broadest possible lines, if the objective of national and industrial prosperity is kept in near view, and if the work is not allowed to become dominated by those engaged in pure science, or in work such as is carried on at the National Physical Laboratory (which has not hitherto made any great impression upon our industrial progress), a widespread interest and co-operation will be quickly developed; and, through the existing educational establishments, and the awards of studentships and fellowships, a continuance of the supply of workers competent to undertake scientific research will be assured. That we have most fortunately a supply of men capable of carrying on the work at the present time is due more to individual mental inclination and ambition than to sufficient external encouragement.

In framing the first scheme of work, the Advisory Council will, as previously intimated, have to make a selection of the lines to be taken, and in this they will be guided by the nation's needs, after giving due consideration to the proposals and considerations that will be submitted to them by the various scientific and industrial institutions. But there is another part of their work that will be highly useful. It is a matter to which Mr. Charles Carpenter called special attention in his recent paper [*ante*, pp. 115, 130] before the Society of Chemical Industry—that is, the need for the co-ordination of, and thus economizing, research. It might almost be imagined that, before drafting the Memorandum upon the Industrial Research scheme, the President of the Board of Education had read Mr. Carpenter's paper, for one part of it is crystallized in the paragraph which reads:

> A large part of their [the Advisory Council's] work will be that of examining, selecting, combining, and co-ordinating rather than that of originating. One of their chief functions will be the prevention of overlapping between institutions or individuals engaged in research. They will, on the other hand, be at liberty to initiate proposals, and to institute inquiries preliminary to preparing or eliciting proposals for useful research; and in this way they may help to concentrate on problems requiring solution the interest of all persons concerned in the development of all branches of scientific industry.

The scheme for the work is excellent; the present financial provision for introducing and establishing it is but meagre. Work of this kind, if worth doing at all, is worth doing well. Of course, money will be voted and provided annually. But the first provision of £25,000 does not strike one as handsome; certainly it does not err on the side of extravagance. The country is to-day spending money at the rate of upwards of 1000 million pounds a year, three-fourths of which amount are due to the war. After the war, there will be a great industrial and commercial struggle to rehabilitate the fortunes of the nations; and it will be a case of the supremacy of the fittest. Where will this country stand in that struggle? The £25,000 suggests frugality in the effort to make the country the fittest. Ideas as to sufficient financing will expand with experience of the work to be undertaken; and with the ideas the provision of money. Whatever money can be well and profitably spent in this research work, should be available for the purpose. Under the advice of the Advisory Council (which is composed mainly of eminent scientific men actually engaged in industries dependent upon scientific work), and the Committee of the Privy Council to whom the Advisory Council will be responsible, excellent reproductive spending should certainly be assured.

The composition of the Committee of the Privy Council and of the Advisory Council is set forth in another column. There is only one remark to make upon the constitution of the Council; and it is that care ought to be taken not to pluralize the public appointments of the members. They have their own private work to do; and the principle of *ad hoc* committees should be applied to the public appointments of men in order to realize the greatest efficiency through, as far as possible, concentration of their talents upon the work. Take Professor Meldola. He is on the Advisory Council of "British Dyes Limited," and on the new Industrial Research Committee. There may, however, be compatibility in these two appointments. Professor Bertram Hopkinson is on the War Inventions Board, and on the Industrial Research Committee. Dr. Percy Frankland is not on the Industrial Research Council, but he is on the War Inventions Board and on the Advisory Council of the Dyes Company. It may be these scientists are also on other bodies. Their names are only quoted here for the purpose of example; and there may be, for aught we know to the contrary, other members of the Industrial Research Council who have likewise accepted positions on other public bodies. All honour and power to them; but the country wants the efficiency that comes from entire concentration of effort and specialization.

Coal Price Bill—A Retrospective Clause.

The Coal Price (Limitation) Bill has passed through all stages of both Houses of Parliament; and the Royal Assent has been given to it, so that it now stands part of the law of the land. The House of Lords did not trouble to discuss it at any length, apparently being satisfied, and with good reason, that all there was to be said *pro et con* had been said in the Lower House, and that there was no use further tinkering it about. It has been described as an emergency measure, for application during the war and for a period afterwards; but it will form a useful basis for later discussion as to whether the best interests of the country would not be served by, through statutory control, preventing those unreasonable flights of coal prices that have taken place on the slightest provocation, especially during recent years. These flights have had very serious effects upon a large coal-purchasing industry such as that devoted to gas supply, and to the providing of considerable quantities of raw materials from which products are derived that are essential to the life of other industries.

Some of the pessimists seem to think that the new measure is not going to serve any useful purpose. If it is not, it is a pity that so much time has been spent over it by our legislators. But that is not our view. The measure now provides an impassable bar at the pithead to excessive prices under the extraordinary conditions of the time; and this should be of considerable advantage in the protection of the industries of the country. It should be, for instance, to the gas industry now and during the continuance of the war, although it means that, during the whole period of conflict, the pithead price of gas coal will remain about uniform at the 1913-14 prices, *plus* the 4s. standard for the "extras" (with a margin) occasioned to coalowners by the war, and the price of gas will consequently in many places continue above pre-war figures. The importance to the gas industry of increases in the cost of coal is seen by the one fact that only 1s. per ton advance means a charge of about 1d. per 1000 cubic feet of gas made; and that 1d. per 1000 cubic feet of gas on the sales by statutory gas undertakings in the United Kingdom in 1912-13 (198,922,469,000 cubic feet) represents £828,843 to be found by the consumers. Multiply this sum by four to equal the 4s. per ton standard excess over 1913-14 coal prices, and the product amounts to no less than £3,315,372! If the total coal consumption of statutory and non-statutory gas undertakings were calculated out at the 4s. per ton increase, it would represent a considerably higher sum.

Various amendments were made during the later stage of the measure in the House of Commons. None of them affect the main parts, but are, generally speaking, insertions to seal-up possible loopholes for escape from the control of the provisions—such, for instance, as a scheming colliery-owner selling indirectly to a customer through a middle buyer, and so evading the Act. The principal alteration made in the measure is the one promised by Mr. Runciman, which will enable those buyers who have made contracts at high prices to come within the operation of the Act—that is to say, in respect of contracts for coal for domestic or household purposes, or for any purpose of local authorities, or for use in the public services of gas, water, and electricity supply carried on "in pursuance of authority given by an Act of Parliament or by an Order confirmed by, or having the effect of an Act." The benefit of the retrospective clause is therefore withheld from non-statutory concerns. The concession only applies to contracts made between April 1 last and up to the commencement of the Act. The obligation rests upon the person or persons who has or have made the contract to give notice in writing, within two months from the passing of the Act, of his or their desire to take advantage of the provision. This will only apply to contract coal delivered after the expiration of three months from the commencement of the Act; and, if the coalowner can show the Board of Trade good cause, the Board have power in individual cases to extend the three months before the Act begins to apply. For the purposes of the Act, too, the contract coal so delivered under this retrospective clause is to be taken as having been sold at the time of delivery. By the clause, the purchaser obtains relief, the coalowner secures a period of grace (during which he may try to fill the stores of the purchaser with the dear coal) before the provision begins to operate, and he may even be able to arrange subsequent deliveries so as to get them to synchronize with the best prices that were obtained at the pithead at corresponding dates in 1913-14. Those purchasers who have already made their contracts must have a care that they give notice within the prescribed period, if they desire to take advantage of the clause; and they must not be so imprudent as to defer reasonable deliveries, and work from stock, so as to secure the lower price. This advantage may be cancelled by a shortage of supply in the winter months. This is really the only change in the measure which directly affects readers who since April 1 have entered into contracts at higher figures than those provided for under the Act. They will find the precise terms of the new provision set out in our "Parliamentary "Intelligence."

Falsification and Fraud.

It is a great satisfaction that it does not fall to our lot to frequently have to report cases of falsification and fraud on the part of the officials of gas undertakings. When on rare occasion we have to do so, it is a matter for the sincerest regret. It is so in connection with the case reported in our "Legal Intelligence" last week and again to-day. Thomas Henry Lamb, for twenty-three years Secretary of the Walton-on-Thames and Weybridge Gas Company, has stood in the dock at the Central Criminal Court alongside a subordinate named George Waters Ross, who was Assistant Secretary and Collector, charged with conspiracy, falsification of books, and robbery of their employers' money—the peculations amounting to several hundred pounds. There is no call upon us to give here greater prominence and emphasis to the details of the case than are supplied by the report of the proceedings. Lamb has stepped from the dock a free man; but Ross has been sentenced to twelve months' imprisonment with hard labour. Though Lamb has been adjudged "Not guilty" of the serious indictments, it is impossible to exonerate him from all blame in the matter; and it must be on his conscience to-day, and ever will be, that, had it not been for his own laxity, and therefore his unfaithfulness, in the discharge of his duties, Ross would not have been given that free and easy succession of opportunity for defrauding his employers in the ingenious manner that he did. Lamb owned up, his Counsel admitted on his behalf, to negligence in checking and supervising the books. This dereliction of duty, and the further unusual act of borrowing money, in connection with Stock Exchange transactions, from, or through, a subordinate such as Ross, made it almost inevitable that the two men, as soon as the defalcations were discovered, would be linked together. However, Lamb has paid the penalty of default and indiscretion by the disgrace of appearing in a criminal dock with the man who is now undergoing the punishment awarded him by the law for his misdeeds.

It was a most complicated case; and the contradictory evidence was such that any Jury would have found it very difficult to have convicted Lamb of the misdoings with which he was charged; but Ross, who had also been in the Company's service a great number of years, stands branded as a thief and a liar. The only redeeming feature of the sordid tale so far as he is concerned is that, though he at first implicated Lamb, he afterwards relented, and testified to the complete innocence of his former superior officer in respect of the frauds. A very unsatisfactory portion of the proceedings was the evidence in regard to the action in the matter of the Fidelity Guarantee Society. Memories seemed to be sadly at fault, and thus at variance, as to what had transpired in connection with the satisfaction by Lamb of the claim of the Society against him, amounting to £500. Lamb explained that he paid the Society this sum as he considered that a moral obligation rested on him owing to his non-detection of the frauds. But naturally the payment of the sum (which there was no obligation for him, being innocent, to pay) was really another link in a chain of circumstances that drew Lamb deeper into this foul mess. The Society's claim was spoken of as a "civil debt;" and Lamb believed he was free from legal prosecution with, in hand, the Society's receipt for the £500 bearing the words "in full "settlement and discharge of all claims under this guaran- "tee." But it was not within the power of the Society to compound a felony, or to give a man acquittal from a criminal charge. The words quoted do not suggest that the Society claimed that power; and the interpretation given to the words by Lamb and those acting with him was—perhaps pardonably—in excess of their literal meaning. The evidence was also contradictory from the three quarters—the Society, Lamb, and the Company—as to the intentions of the Directors of the Company in regard to the prosecution of Lamb. But what is clear is that, whatever was said or believed, the Society had no authority from the Board to give Lamb any assurances as to their action in the event of him satisfying the Society's claim.

The whole case is one of several unpleasant features apart from the more serious ones; and warning stands out from every phase of it.

South Metropolitan Gas Accounts.

The accounts of the South Metropolitan Gas Company came to hand on Saturday as the "Journal" was being "made up" for press—earlier than customary owing to the interruption of the normal week's work by the Bank Holiday. In view of this, our examination of the results of the working must be deferred until next week; but the Directors' report and the statement of accounts are, in the main, reproduced in another part of this issue. The decrease in the consumption of gas (owing to the lighting restrictions) is only 3·73 per cent. as compared with the corresponding period of last year, when an increase of 2·29 per cent. was registered. As the Directors did not look upon a decrease of 4·29 per cent. in the December half of 1914 (with five war months in it) as "disappointing," the smaller percentage reduction over the past six months' trading under war conditions must be regarded, in the circumstances, as satisfactory. The price of gas having been raised to 2s. 10d., the sliding-scale (which is a description of extraordinary suitability to-day) has caused the dividend to slide-down from the rate of £5 9s. 4d. per cent. per annum to £4 8s. per cent.—a reduction of £1 1s. 4d. The carry forward is £3589; but there was only £1202 brought into the half year. This shows that, in calculating the effect of increasing the price of gas and reducing the dividends, the Directors gauged closely the extent of their probable requirements.

The Price and Shortage of Sulphuric Acid.

Coke-oven owners, like gas-works, are suffering from the high price and shortage of sulphuric acid of the quality best suited for sulphate of ammonia production. This is due to the large requirements of the Government. "Event and Comment" has in our columns called attention to this on previous occasions; and last December he stated that he had heard of cases where, owing to acid being unobtainable, loss of ammonia was actually taking place. This is a serious business for the coke-oven people, who are just as dependable on the good prices of sulphate of ammonia as gas-works for presenting a satisfactory balance-sheet. A writer in the "Iron and Coal Trades Review" now confirms the statement of our own contributor. Alleging that, owing to the high price of sulphuric acid, "many contracts" have either been repudiated or else considerably modified, he goes on to hold out the mournful prospect of sulphate makers having no option but to run their ammonia to waste, if the necessary sulphuric acid does not become immediately available. We hope nothing so deplorable will occur. Alternatives in the way of manufacture are also considered by him. There is the production of ammonium salts; but it is no good discussing the further manufacture of something the existing supply of which is equal to, or actually exceeds, the demand. The same writer raises the question of coke-oven owners making their own sulphuric acid. A similar suggestion relating to gas undertakings was put forward in our editorial columns on Nov. 17 last; and gas undertakings of sufficient size, or a group of smaller gas-works, are in a better position than most coke-oven makers to enter upon sulphuric acid manufacture, owing to the availability of sulphur in the oxide purifiers. It is not usual at coke-oven plants to purify the gas, although with the extension of the adoption of gas-engines for power, this is being done, owing to the deterioration caused by the sulphur in the gas. Gas-engine driving and sulphuric acid requirements may between them cause a large extension of oxide purification of the gas from coke-oven plants.

Gas-Works and Rubber Manufacture.

Under this heading, the "Gas Engineering Correspondent" of "The Times" writes on the "prospects" of the production of artificial rubber by gas-works. But the "prospects" are of the visionary order; and this he confesses. It is not a new subject; but that synthetically produced rubber will ever come into strong competition with the ordinary commercial commodity is, for several reasons, very unlikely. It is pointed out that chemists assign to rubber an empirical formula similar to that of isoprene; and in one of the latest processes (which, though it is improbable it will ever enrich him, is thought to be of interest to the gas engineer) isoprene is the staple product. In distilling coal, small quantities of isoprene result from the combination of carbon and hydrogen, and are to be found in the escaping gases. The separation of the isoprene is effected by benzol, which is distilled at a comparatively low temperature, and is afterwards heated with sodium in the form of threads or sheets, and maintained at atmospheric temperature. A brownish coloured powder, consisting of hydrocarbons of the acetylene series, in combination with the sodium, is then deposited, and, when the action is complete, a gelatinous mass results. On the proper consistency being reached, the sodium compounds are filtered off, the mass is washed with benzol, and the precipitation of the rubber is secured by the aid of alcohol. Sulphur compounds in the benzol present a difficulty, but an appreciable proportion of these could be removed by washing with sulphuric acid. The chief impurity is carbon disulphide, which offers the greatest resistance to ready treatment. So far as this country is concerned "Gas Engineering Correspondent" considers the process is only of academic interest. In working the process, it is evident, close technical supervision would be required. Gas managers are very busy just now developing their businesses on practical and paying lines; and they will not be disposed to go dabbling in a venture, and saddling themselves with a process obviously containing little or no profit for their concerns.

THE DEATH OF MR. EDWARD ALLEN.

Letter of Sympathy from the French Gas Society.

We have received from Mr. Walter T. Dunn the following translation of a kindly letter of sympathy from the Société Technique de l'Industrie du Gaz en France, in the loss sustained by the Institution of Gas Engineers by the death of Mr. Edward Allen. A copy of the reply of Mr. John Young, of Hull, the President of the Institution, is appended.

[Translation.]

Société Technique de l'Industrie du Gaz en France,
94, Rue Saint-Lazare, Paris,
July 23, 1915.

John Young, Esq.,
President of the Institution of Gas Engineers,
39, Victoria Street, Westminster, S.W.

Mr. President and dear Colleague,—The English journals have made known to us the death of Mr. Edward Allen, Engineer of the Liverpool Gas Company, Past-President of the Institution of Gas Engineers, and Honorary Member of the Société Technique de l'Industrie du Gaz en France.

I beg you to accept the assurance of the profound sympathy of our Council in the loss sustained by the Institution of Gas Engineers. The long career of Mr. Edward Allen was spent entirely with the Company he served with so much distinction, and we know how highly he was regarded by all his colleagues—a regard which was eminently justified by his numerous attainments.

Will you transmit to the members of the Institution of Gas Engineers the expression of our condolence, and accept, I beg of you Mr. President and dear colleague, the assurance of my devotion.

(Signed) F. Rouland, President.

The Institution of Gas Engineers,
39, Victoria Street, Westminster, S.W.,
July 28, 1915.

Monsieur F. Rouland,
President de la Société Technique de l'Industrie
du Gaz en France,
94, Rue Saint-Lazare, Paris.

Dear Mr. President and Colleague,—Please accept my sincere thanks for your kind letter of sympathy in the great loss which we have sustained by the death of Mr. Edward Allen. Mr. Allen's sweet personal nature and high attainments endeared him to all who knew him, and the suddenness of his death came as a great shock to all.

Again thanking you for your sympathy, and with kind regards,
Believe me, dear Mr. President and Colleague,
Yours very sincerely,
(Signed) John Young, President.

CITY AND GUILDS EXAMINATIONS PROGRAMME.

The programme for the session 1915-16, a copy of which has been received from the Department of Technology of the City and Guilds of London, contains the usual information with regard to the large number of examinations to be held. So far as concerns those in which readers of the "Journal" are particularly interested, the principal alteration in the present edition of the programme is the revision of the syllabus relating to the examination in "Coal-Tar Distillation and Intermediate Products." The lists of works of reference which candidates are advised to consult have also been revised. The following are the Acting Examiners in the subjects named: "Coal-Tar Distillation and Coal-Tar Products," Mr. W. H. Coleman and Dr. J. C. Cain; "Gas Engineering," Mr. Samuel Glover; "Gas Supply," Mr. Walter Hole; "Gas-Fitting," Mr. Henry Kendrick and Mr. Ralph Halkett; and "Heating and Ventilating Engineering," Mr. A. H. Barker. The date of the examination in "Gas Engineering" is Saturday, April 29; "Gas Supply," Saturday, May 6; and "Gas-Fitting," Monday, May 1.

Particulars are given of the scholarships, exhibitions, and money prizes offered by the City Livery Companies and other bodies. In "Gas Engineering," "Gas Supply," and "Gas-Fitting," the Society of British Gas Industries again offer prizes of £3 3s. and £2 2s. to the first and second candidates respectively at the Final Examination in each subject, provided that they are eligible under one of the rules which is named. The list of persons registered as qualified teachers in technology forms the concluding section of the book.

It may be added that copies of the programme (price 9d. net, postage extra) may be obtained from the Publisher, Mr. John Murray, Albemarle Street, W. The report on the work of the Department of Technology for the preceding session, in which are reprinted the question papers and examiners' reports on the results of the examinations, may be had at the same address and at the same price.

A sum of £10,000 has been presented by Mr. Heath Harrison (of the Harrison Shipping Line) to the Liverpool University, for the endowment of a Chair of Organic Chemistry. Realization of the importance to the country of the application of scientific knowledge to the solution of industrial problems is what has led Mr. Harrison to make this gift.

PERSONAL.

The Corporation of the City of London last week unanimously appointed Mr. Ernest Edward Finch City Engineer in succession to the late Mr. Frank Sumner. Mr. Finch, who is to receive a salary of £800 a year, has for some years past occupied the position of Chief Assistant in the Engineer's Department.

The retirement of Mr. Higginson from the position of Secretary and Manager of the Broadstairs Gas Company was referred to in last week's issue. We have since learnt that Mr. W. Dallas, the late Chief Clerk, has been appointed Secretary and Manager of the Company, and Mr. E. James has been, tentatively, appointed Works Manager.

Out of the 43 applicants for the position recently advertised in the "Journal" in connection with the Abertillery Urban District Council Gas Department, Mr. Ernest D. Wootten has been selected as Manager. He was formerly Assistant to the Engineer of the Burslem Corporation Gas-Works, Stoke-on-Trent, and was latterly Manager of the Cockermouth Urban District Council Gas-Works.

The Directors of the Salisbury Gas and Coke Company have appointed Mr. William Fielden, late Manager of the Staines and Egham Gas Company (now incorporated with the Brentford Gas Company), to fill the vacancy created by the retirement of Mr. N. H. Humphrys. Previously he was on the staff of Mr. R. W. Edwards, of the Aldershot Gas, Water and District Lighting Company, going there from the Todmorden Gas-Works. Mr. Fielden takes office at Salisbury on Oct. 1.

OBITUARY.

Mr. S. H. Kimbell, who has been Secretary of the Wellingborough Gaslight Company, Limited, since September, 1873, died on Monday last week, in his 71st year, after an illness of about two years' duration.

Mr. William Shankland, whose death is announced, was appointed a Director of the Girvan Gas Company as long ago as 1866, and was made Chairman about ten years since. He was one of the leading business men of the town.

The death has occurred of Mr. Thomas Gass, aged 68, who was for many years Manager of the Ecclefechan Gas-Works, of which he later became proprietor. He continued to occupy the position of Manager until seven or eight years ago, when he retired.

The "Journal für Gasbeleuchtung" for July 17 reported the death, on the western battle front, of Herr Max Paschasius, the Engineer of the gas, water, and electricity works of the Corporation of Ratibor, in Upper Silesia. Deceased, who was a First Lieutenant, in charge of a company, had been Assistant at the Osnabrück gas, water, and electricity works prior to his appointment at Ratibor.

Engineership of the Liverpool Gas Company.

Consequent upon the death of Mr. Edward Allen, the Directors of the Liverpool Gas Company have decided to appoint shortly a Sub-Committee, to recommend certain re-arrangements of the duties connected with the several departments of the Company, after which it is their intention to appoint Mr. R. E. Gibson (who was Assistant-Engineer under Mr. Allen) to the vacant position of Engineer. Meanwhile, the Directors have authorized Mr. Gibson to use the title of Engineer.

American Prize for a Fire-Place Gas-Heater.

It was stated in the "Journal" in August of last year [p. 477] that a Joint Committee had been formed by the American Gas Institute and the National Commercial Gas Association (of America), to deal with the subject of fire-place heaters, and that they were offering a prize of $150 for the best design of one to burn gas. In announcing the offer, the Committee said: "There are several types of heaters on the market which are fairly satisfactory from the standpoint of heat production, but do not meet the requirements from the standpoint of appearance. The Committee want a design of heater that may be placed in the open fire-place of the library, living-room, or dining-room of an artistically furnished dwelling, which will be appropriate for the purpose, and artistically consistent with the furnishings of the room. The appearance when unlighted is of equal importance with the appearance when lighted; and in awarding the prize, these two features will be given equal prominence." We now learn from the Committee that judgment in the competition on fire-place gas-heater design has been given in favour of Messrs. R. S. Stokvis and Zonen, Limited, of Rotterdam. The judges were three Philadelphia architects; and there were seventeen designs entering into the competition. Further details regarding the winning design will be submitted with the report the Committee will make to the American Gas Institute and the National Commercial Gas Association.

ELECTRICITY SUPPLY MEMORANDA.

Superficiality.

Some of the men whose calling is electrical are fond of variety and the extremes in variety. If they desire to show that 2 and 2 make 4, or that the electric cooking load (where there is any) does not overlap the lighting load, or that, while electricity is charged at ½d. per unit for cooking for two or three comparatively short spaces of the day, 6d. per unit is a fair charge for lighting purposes, they can to that end cover sheets of foolscap with formulæ and hieroglyphics, and the man in the corporation committee room is not, as a result, one whit the wiser. At the other extreme, if an electrical journalist wishes to criticize anything a gas man has said, he can please his electrical readers with the most lightsome superficiality and triviality. From this sort of thing certain of the electrical "technical" journals have now degenerated by introducing into their publications a comic section. Awards in the way of phantom hot-plates are also another brilliant development for a "technical" paper. We commend to the consideration of the "Electrician" the award of a hot plate to the writer of "Gossip" in "Electrical Industries." He deserves it for the distinguished superficiality with which he has commented upon the articles of Mr. H. C. Widlake that have been appearing in our columns on the subject of "Power Production: The '*£ s. d.*' of the Question." Our contributor would no doubt be overwhelmed with gratification at the entertainment with which the gossiper of "Electrical Industries" would like people to believe he has been provided, were it not that the form of the criticism must show him that the critic has found the groundwork of the article too difficult to deal with, and so has contented himself with scratching the surface of the hard ground like a hen in search of grubs. The critic credits Mr. Widlake with "commendable wisdom," which is a virtue of which electrical competitors usually fight shy. The critic tells his readers that Mr. Widlake reports that the progress made by the electric-motor in the industrial world is due to the "lofty disdain" entertained by gas engineers for electric prime movers, which is not at all what our contributor did. What he was impressing upon gas engineers was that they had "absolutely played into the hands of our electrical opponents by indulging in the foolish policy of underrating a powerful enemy," and had looked with "lofty disdain upon a machine whose applicability for certain purposes cannot be denied by any intelligent person." This does not suggest that progress would not have been made by the electric-motor if the "lofty disdain" had been non-existent.

Cost Basis and the Load.

The only material piece of criticism by "Electrical Industries" is this; and it does not go far towards destroying Mr. Widlake's argument and comparison:

> In reducing his arguments to a cash level, Mr. Widlake has prepared two of the most brilliant comparative tables it is possible to imagine. Comparing the yearly working costs of gas-engines and electric-motors, he takes the price of gas to be 1s. 4d. per 1000 feet and the price of electricity to be 1½d. per unit (an eminently satisfactory basis!); but on top of this he assumes the gas-engine and the motor to put in 2800 working hours per annum "at normal load." The absurdity of such a supposition is, of course, self-evident.

Regarding the costs, the critic knows that the writer of the articles in question hails from Plymouth; and the costs he took were the actual ones obtaining in that district prior to the commencement of the war. As to the assumption of a normal load, some basis had to be taken; and both gas-engine and electric-motor were similarly dealt with, notwithstanding that the efficiency of the electric-motor decreases with load. Will the critic show what other standard basis for ascertaining comparative data could be taken? There must be an equality of fundamental conditions. Surely the critic is not foolish enough to think that our contributor is unacquainted with the fact that no engine or motor in a factory works at normal load "week in, week out, from morn to night;" and yet his flimsy criticism seems to suggest that he does.

The "Messy" Lubricant.

The critic, from the mass of data and argument, selects for his main "offensive," as though it was the strongest point presented, the question of the charge for lubricating oil! Marvellous discrimination! He says:

> This running charge is set forth in the following terms: "Lubricating oil at 1s. 6d. per gallon—5s. 7½d." So that, in order to operate a 1½ horse-power electric motor for twelve months, the wretched electric power consumer is to be forced to purchase and make away with the best part of 4 gallons of lubricating oil. But where he is to pour this huge volume of messy fluid our author, with great carelessness as it seems to us, fails to mention.

What is the value of such criticism as this? The oil allotted to the electric-motor was very little, and made a very modest difference to the charges. On the 47 B.H.P. machine, this would run out at under 0·002d. per B.H.P. hour. The running costs of the motor, neglecting oil, would be 1·3d. *minus* 0·002d., or 1·298d. per B.H.P. What a stupendous matter for electrical wisdom to lay hold of! If the electrical critic suggests using less oil than this, his ideas on plant cleanliness leave much to be desired, as it is the usual thing, recommended even by the manufacturers, that the wells should be flushed-out and refilled every time the motor is cleaned. The enormous amount of 4 gallons of waste oils of which the user of the 1½ B.H.P. motor would have to dispose is truly an appalling problem, more particularly as it would come on his hands in 52 instalments of about 0·6 pint each, providing he gives his motors a weekly clean. May we suggest, in view of the hugeness of this quantity, and the enormous task of handling it, that the embarrassed user might, provided he has no oil-cans which require replenishing, enter into a contract for refining it, when the magnitude of the amount would probably get him very favourable terms on an annual contract. "Electrical Industries" alludes to the opinion of the Metropolitan Spring Mattress Company as to the cost of gas-engines and electric-motors at their works. Need we say that, as our electrical contemporary refers to this case with considerable gusto, the opinion is favourable to electric-motors. We should like "Electrical Industries" to publish a detailed table of the comparative costs at the works in question, with information as to types, age, &c., of the machines. We ask for these because there are many good illustrations of gas power having completely beaten electric power.

The Motor, the Purpose, and the Charge.

The decision in the Alloa Theatre case [referred to in the "Memoranda" last week] has set the electricians hopping about the question of whether or not the correct policy is to charge the energy supplied to motor generators under the power or the lighting tariff. As gas suppliers (as stated last week), we should prefer to see electricians charging the lighting rate for the purpose; if we were electricity suppliers, as a matter of practical and sane policy, the power tariff would win. Electrical men would rather cling to charging at the lighting rate; but prudence holds up a warning finger. Mr. A. J. Abraham, of Aberdare, has written to the "Electrical Times" on the subject; and he takes the practical view. He rightly asserts that no electrical engineer, tempt he never so wisely, is going to throw out private gas or oil driven plants by adopting the lighting rate. He gives those municipal authorities a nasty facer who urge that the lighting rate should be charged when he says that certain corporations will supply other motors which come on to main peak at fixed power rates, and yet directly it is a motor which drives a dynamo they try to make out that it is not power because it is driving a dynamo, "so that the engines in our power stations are not power either." Then he gets in another blow when, having stated that he would gladly supply a motor at power rates which drives a gas-lighting plant, he says he hopes before the winter to supply the Aberdare Gas Company with a lot of power, to the mutual advantage of both undertakings. "I did not say to the Gas Company: 'I cannot supply you with power at power rates because you want it to make gas for lighting, and therefore it is not power.' I wonder whether the Alloa Corporation would have said this." Referring to this letter, "Meteor" remarks that the present conditions in the fuel, labour, and materials markets, has put tariffs into the melting-point. But he is faint-hearted over the prospect of a satisfactory one emerging. He does not deal with the practical issues raised by Mr. Abraham. He is, however, sadly afraid of the logical consequences of supplying cinematograph owners with energy at lighting rates for motor generators, because he foresees the proprietors of factories and large shops claiming the same thing. The consequences are admittedly far-reaching. But the question is, Are electricity suppliers going to take this business or renounce it by charging-up at lighting rates? Naturally, we should prefer to see them adopt the latter course. A gas-engine can be connected-up to the dynamo just as well as a motor; and, if the gas supplier is not prepared to furnish gas for the engine at power rates, well a gas-producer plant can always be installed. It will not be the arguments of "Meteor" which will settle the question of the correct charge, but the more cogent argument that can be administered by the user, who has a variety of methods at command for bringing the electricity supplier to reason. However, we sincerely hope that all electricity suppliers will stick resolutely to the lighting rates for the supply of motor-generator sets. They ought to for the sake of doing a good turn to the gas industry, and in order to merit its blessing.

Cheap Work in the Villa.

The suppliers of electricity would like other people to work for next-to-nothing in order to produce benefit for their electricity undertakings. The manufacturers of electricity appliances are charged with putting prohibitive prices upon their wares; and the electricity suppliers expect labour, materials, profit, and all else to be squeezed into a very emaciated-looking selling price. The contractors are also expected to do the wiring of premises at prices which will not keep some of them out of the bankruptcy courts. If anyone is to blame for the cheap and nasty electrical wiring and goods introduced into the houses of consumers, it is the electricity supplier. He clamours for cheapness on the one hand; he reaps a bountiful harvest of complaints on the other. So much has this been so in connection with the few electric-cookers fixed, that electrical engineers have seen the wisdom of switching-off cheapness on to something more substantial, and therefore more costly. Cheapness in electrical work has been of the greatest possible use to the gas industry, while it was intended to be the reverse. The writer of "Installation Topics" in the "Electrical Times" complains of the large amount of villa property left in the hands of the gas supplier. There is nothing for surprise in this. Occupiers of villa property are not people of unlimited means; and they like to see economy, efficiency, and a big range of service all brought into one moderate account. Villa residents were not divorced from gas prior to the war; and they are hardly likely to be captured to any extent during the war and for some years to come —if ever. Their capacity for increasing expenditure has been reduced by the war; and the political and financial prophets tell us that the burdens of the great upheaval are going to be felt by the community for many years to come. The surprise of "Installation Topics" that so small a proportion of villa property is wired for electricity supply will have to continue. He uses a town down south as an example of the little that has been done for electricity among villa property. From what he says, the electricity department does not canvass the smaller households; and the contractors simply wait in the true Micawber spirit for something to turn up. When the contractors do get an inquiry, they quote what are considered to be exorbitant figures. For the wiring of a six-roomed house, £10 was asked, exclusive of fittings, lamps, and switches; and the householder could not afford this outlay. The writer of "Installation Topics" is of opinion that the work with surface wiring could have been done for £4 or £5, or a complete installation, including plain fittings, lamps, and switches, could have been put in for about £7. We have examined electric-lighting installations that have cost about £7 complete. Heaven forbid we should ever have anything to do with similar shoddy work for villa residences. We know instances of a gradually dropping-off of electricity consumption, and a return to gas, where such installations have been made. Rapid deterioration breeds neglect and dissatisfaction. "Installation Topics" regrets that "contractors should quote prices that they must know quite well are beyond the limits of the potential consumer." Electrical contractors must live now that they have been created. But electricity suppliers devoutly wish the contractors had never had any part in the great mundane scheme; and we believe with the fullest confidence that the former would not mourn if they awoke one morning to the intelligence that the latter had, by some benevolent dispensation, ceased to have part or place in the electrical world's affairs.

Pope's Patent.

The Osram Lamp Works, Limited, have had such a long chain of successes in connection with their infringement litigation that it must have come as a sad blow to them to hear Mr. Justice Joyce give judgment in favour of Pope's Electric Lamp Company, Limited, also in an action for infringement. The case was submitted to his Lordship in elaborate form. The patent that was being defended by the Pope Company was not merely for manufacturing a tungsten filament, but for the specified method or process for making the filaments; and his Lordship was convinced that the process was so different from what was particularized in the plaintiffs' specification that he declared there was no infringement. Costs were granted on the higher scale. The matter is of such importance to the Osram Company that it has been intimated that an appeal to the House of Lords is to be set down this side of the vacation.

"Half Watts" in New York Streets.

It is stated by the "Electrical World" that, during the last six months, upwards of 10,000 arc lamps have been replaced by an equal number of "half-watts" of various sizes from 300 to 1000 watts. The size of lamp installed was determined by the illumination demands of the immediate vicinity: Large squares at intersecting streets and junction points, 750-watt lamps; important thoroughfares, 500-watt lamps; cross-town thoroughfares, tree-lined, or parked avenues, and streets and avenues with car-lines, 400-watt lamps; mercantile and wholesale districts, residence streets, and small parks, 300-watt lamps. Approximately 600 multiple-arc lamps in use on the bridges connecting the several boroughs have also been replaced by 300-watt gas-filled tungsten lamps.

Air Raids and Generating Stations.

The "Electrical Review" has been congratulating the electricity supply industry upon the fact that, in the air raids that have so far been made, electricity generating stations have escaped any damage; but our contemporary admits that such stations are not bomb-proof. It also acknowledges that one high explosive bomb successfully placed might wreck an entire station, and do such injury as to prevent the supply of electricity for a very long time. It considerately omits to mention that the gas industry is supplying a large quantity of substances required for making high explosive shells and bombs, and is thus helping to save the country from the certain defeat there would be if these forms of destructive instrument were not available to this country, while being so to enemy countries. Supposing, however, a bomb or shell hits an electricity station in its vital parts and incapacitates it, our contemporary inquires whether the failure to continue supplying in such circumstances would expose to any liability the company or the local authority supplying electricity. From its examination of the position, the "Review" arrives at the sapient conclusion that, although the Legislature never contemplated damage from hostile aircraft, there is ample protection in the proviso to section 30 of the Electric Lighting Clauses Act, 1899.

THE GAS LIGHT AND COKE COMPANY.

Half-Yearly Report.

The following is the report of the Directors of the Gas Light and Coke Company for the half year ended the 30th of June, which, with the accounts (some particulars from which are given below), will be presented at the ordinary meeting on Friday.

The accounts for the past half year show that, after providing for fixed charges and setting aside £5000 towards the redemption fund, there remains a profit balance of £395,050 13s. 11d. The amount brought forward from the previous half year being £384,538 3s. 10d., there is an available balance of £779,588 17s. 9d., out of which the Directors recommend the payment of a dividend on the ordinary stock at the rate of £4 4s. per cent. per annum, which will absorb £343,501 6s. 1d.

The sum to be carried forward to the credit of the current half year is £436,058 11s. 8d.

The sales of gas for the half year show a decrease of 4·31 per cent. on the quantity sold during the corresponding period of 1914. This result was brought about by the continued official restriction of lighting in the Company's area.

Prices of coal and oil having steadily advanced during the half year, the Directors were compelled again to raise the price of gas (from 2s. 8d. to 3s. per 1000 cubic feet), involving a statutory reduction of dividend from £4 13s. 4d. per cent. to the lower rate now recommended—viz., £4 4s. per cent. per annum.

There has been an increase during the past six months of 1679 in the number of consumers, and of 16,600 in the number of gas-stoves sold and let on hire.

The number of the Company's employees on active National Service is now about 2200. The Directors much regret that the list of casualties has been heavy. To the relatives of the brave men who have fallen, as well as to the suffering wounded, the shareholders will no doubt wish to join with the Directors in offering sincere sympathy.

The Court of Directors has been furnished by the several Engineers of the Manufacturing and Distributing Departments with certificates that all the Company's works and plant have been maintained in thorough efficiency.

Corbet Woodall, *Governor.*

Horseferry Road, Westminster, S.W., July 20, 1915.

The Accounts.

The accounts accompanying the report consist of the usual statements.

The statement of capital (stock) sets forth that the total paid-up is £10,413,480; added on conversion, £12,832,955—total amount authorized, £23,246,435. Deducting the amount redeemed, £226,995, the total amount of the Company's existing capital powers is £23,019,440. The statement of loan capital stands thus: Total paid up, £3,186,660; added on conversion, £1,618,190; unissued, £750,000—total amount authorized, £5,554,850.

The capital account shows receipts (with premiums, £1,688,957 14s. 8d.) to the amount of £29,513,247 14s. 8d. The expenditure is shown in the following items:—

Expenditure to Dec. 31, 1914		£14,880,254 7 11
Expenditure during the half year to June 30, 1915—viz.,		
Buildings and machinery in extension of works	£18,625 16 1	
New and additional mains and service-pipes	8,163 11 0	
Do. do. meters	8,633 13 8	
Do. do. stoves	17,871 5 8	
		53,294 6 5
		£14,933,548 14 4
By sale of surplus land	£7,453 7 8	
,, depreciation of plant	27,172 11 2	
,, depreciation of meters and stoves	62,382 10 5	
,, depreciation fund (works on leasehold lands)	12,000 0 0	
		109,008 9 3
Total expenditure		£14,824,540 5 1
Nominal amount added on conversion		14,451,145 0 0
		£29,275,685 5 1
Deduct amount of capital redeemed under Company's Act of 1903		226,995 0 0
		£29,048,690 5 1
Balance of capital account		464,557 9 7
		£29,513,247 14 8

The total of the net revenue account is £1,014,578 1s., compared with £1,157,928 at June 30, 1914. The balance applicable to the redemption fund and to dividend on the ordinary stock is £784,588 17s. 9d.; and the following statement shows how it is proposed to appropriate it:—

June, 1914.			
£614,053	..	Net balance brought from last account	£384,538 3 10
334,477	..	Net revenue for the half year	400,050 13 11
£948,530			£784,588 17 9
15,000	..	Contribution to redemption fund	5,000 0 0
£933 530			£779,588 17 9
(£4 17s. 4d. p. ct.)		Dividend on the ordinary stock—	
£398,164	..	£4 4s. per cent. per annum on £16,357,205	343,501 6 1
52	..	Forfeitures for deficiency in illuminating power	29 0 0
£535,314	..	Balance carried to next account	£436,058 11 8

The three statements relating to the reserve, special purposes, and depreciation funds stood as follows on June 30: Reserve fund, £74,726; special purposes fund, £307,536; depreciation fund, £91,128.

The following is the revenue account:—

Expenditure.

June Half Year, 1914.		£ s. d.	£ s. d.
	Manufacture of gas—		
£788,402	Coal, including all expenses thereon	713,214 15 9	
80,410	Oil ,, less value of oil tar	10 ,235 9 7	
51,581	Coke and breeze used in the manufacture of carburetted water gas	67,384 18 11	
15,941	Salaries of Engineers and other officers at works	15,574 9 10	
96,937	Wages	88,636 8 11	
14,746	Purification	12,905 8 5	
245,879	Repair and maintenance of works and plant, materials and labour, less received for old materials, £6643 6s. 6d.	240,200 6 3	
	Distribution of gas—		1,239,151 17 8
61,277	Salaries and wages of officers (including rental clerks)	61,547 4 0	
99,753	Repair and maintenance of mains and service-pipes, &c.	90,013 17 4	
81,768	Repair and renewal of meters	89,440 9 11	
98,402	,, ,, stoves	97,974 14 1	
20,804	Gas-fittings, including labour (automatic meter supplies)	13,363 9 2	
			352,339 14 6
26,234	Public lamps—lighting and repairing	..	25,971 12 3
	Rents, rates, and taxes—		
7,163	Rents payable	7,175 0 7	
168,172	Rates and taxes	168,301 3 1	
	Management—		175,476 3 8
3,750	Directors' allowance	3,750 0 0	
304	Company's Auditors and Assistant	302 2 0	
9,536	Salaries of General Manager, Secretary, Accountant, and clerks	9,426 17 5	
27,022	Collectors and cashiers	28,080 7 0	
4,985	Stationery and printing	4,673 2 6	
6,509	General charges	6,112 5 4	
			52,344 14 3
	Co-partnership, for twelve months to June 30, 1915	29,953 0 2	
22,653	Less on Account	17 000 0 0	
			12,953 0 2
2,079	Parliamentary charges	..	50 0 5
1,502	Law charges	..	554 4 11
..	Charges *re* Quinquennial re-valuations	..	1,050 0 0
4,975	Bad debts	..	7,012 2 7
500	Depreciation fund for works on leasehold lands	..	500 0 0
27,487	Annuities to officers and workmen, including contribution to officers' superannuation fund	..	27,439 5 3
..	Allowances to employees on Active Service	..	7,135 16 1
3,193	Workmen's compensation account	..	1,496 16 3
4,526	Company's Contribution under National Insurance Act, 1911	..	3,883 1 6
	Public officers—		
1,258	Gas Referees and Official Auditor	1,258 1 0	
685	Public testing-stations	567 19 6	
			1,826 0 6
£1,978,433			1,909,184 10 0
538,875	Balance carried to net revenue account		630,039 17 2
£2,517,308			2,539,224 7 2

Revenue.

June Half Year, 1914.		£ s. d.	£ s. d.
	Sale of gas—		
£1,662,273	Per meter at 2s. 8d., 3s., 2s. 4d., and 2s. 10d. per 1000 cubic feet	1,805,640 13 2	
61,680	Public lighting and under contracts	49,103 16 8	
			1,854,744 9 10
£1,723,953			
74,416	Rental of meters	..	76,276 18 8
72,580	Rental of stoves	..	77,584 19 8
90,220	Rental of fittings	..	85,123 12 2
	Residual products—		
£311.006	Coke, less labour, &c.	254,980 13 9	
23,230	Breeze, less ,, ,,	31,512 8 1	
101,393	Tar and tar products	71,093 13 6	
114,438	Ammoniacal liquor and sulphate of ammonia	81,862 2 7	
			439,448 17 11
£550,067			
£5,772	Rents receivable		5,830 13 11
300	Transfer fees		214 15 0
£2,517,308			2,539,224 7 2

The following statements relate to the working:—

Statement of Coal, &c.

Description of Coal.	In Store Dec. 31, 1914.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1915.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	130,423	778,259	731,357	1417	175,908
Cannel	8,416	2,315	5,339	..	5,392
Total	138,839	780,574	736,696*	1417	181,300

* In addition to this quantity of coal, 11,675,747 gallons of oil were used during the half year.

Statement of Residual Products.

Description.	In Store Dec. 31, 1914.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store, June 30, 1915.
Coke—tons	61,694	455,068	91,302	413,802	11,658
Breeze—tons	17,164	107,293	12,275	110,947	1,235
Tar, from coal only—galls.	1,957,754	7,713,987	6,909,754	485,556	2,276,431
Ammoniacal liquor—butts	22,676	206,823	209,418	..	20,081

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).		
Thousands. *14,411,622	Thousands. 284,639	Thousands. 13,169,114	Thousands. 13,630,560	44,766
†15,411,624	467,073	13,592,381	14,252,531	45,108

* Including 4,802,270,000 cubic feet of carburetted water gas. † June half year, 1914.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the half year as follows: Coal, £165,951; gas oil, £41,958; coke, £6988; tar and ammoniacal liquor and products, £96,663; and sundries, £384,477. The figures this time last year were: Coal, £197,925; gas oil, £38,014; coke, £60,220; tar, ammoniacal liquor, and products, £82,993; sundries, £336,247.

SOUTH METROPOLITAN GAS COMPANY.

The Directors' Report and the Accounts.

The following is the report of the Directors of the South Metropolitan Company for the six months ended the 30th of June, which, with the accounts (an abstract of which appears below), will be presented to the proprietors at the half-yearly meeting to-morrow week.

Notwithstanding the increase to 2s. 10d. per 1000 cubic feet in the price charged for gas, and the consequent reduction of dividend by the sliding scale to £4 8s. per cent. per annum, the working for the half year shows an increase in the amount to be carried forward of only £3589.

This result is entirely accounted for by the extraordinary prices charged for coal and its freightage to London—some of these being nearly treble those paid in recent years. It is significant that the Government are at last applying to coal suppliers the same principles which have been in operation for forty years with regard to gas suppliers—viz., parliamentary regulation of the prices to be charged. The freight question can be solved by the purchase of steamers; and this course has now been adopted.

The consumption of gas shows a decrease of 3·73 per cent. as compared with the corresponding period of last year. The decrease is accounted for by the enforced reduction of outside lighting.

Residuals show an appreciable improvement, mainly owing to the increased value of fuel and the activity of the chemical industry.

In order to provide for the extending requirements of the business, stock to the amount of £100,000 is being offered to the Company's employees and gas consumers.

Owing to a large number of employees having joined His Majesty's Forces, it has been found necessary, in the clerical and commercial branches of the Company's business, to engage female assistants. The result has been in every way satisfactory.

The co-partnership continues to work smoothly and well; the employees bearing with the shareholders and consumers the results of the increased cost of raw materials.

CHARLES CARPENTER, *Chairman.*

709, *Old Kent Road, S.E., July* 28, 1915.

The Accounts.

The following are the principal portions of the accounts accompanying the preceding report.

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £418,671 (Act of 1901) of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,798,994 and £96,451 (Act of 1901). The third statement is the capital account. It stands as follows: Amount received, £5,328,820; nominal amount added by conversion (less premium), £2,996,520—total, £8,325,340. The items of expenditure are as follows:—

Capital account to Dec. 31, 1914		£5,120,441 5 11
Expenditure during half year to June 30, 1915—viz.:		
New buildings and machinery in extension of works	£87,850 0 0	
New and additional mains and services	2,086 2 7	
New and additional meters	2,379 2 8	
New and additional stoves	2,980 5 11	
		95,295 11 2
Total expenditure		£5,215,736 17 1
Balance		113,083 2 11
		£5,328,820 0 0
Nominal amount added by conversion, less premium		2,996,520 0 0
Total		£8,325,340 0 0

The net revenue account shows a sum of £146,249 7s. 5d. applicable to dividend on the ordinary stock. Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on June 30 were as follows: Reserve fund, £198,451 11s. 11d.; renewal fund, £26,557 7s. 3d.; insurance fund, £26,707 7s. 5d.

The following is the revenue account:—

Expenditure.

Manufacture of gas—		
Coal into store, including £1068 10s. 6d. for London Port and tonnage dues	£592,260 15 11	
Purification	19,047 0 4	
Salaries of Engineer and Officers at works	19,066 11 3	
Wages (carbonizing)	50,352 19 7	
Repairs and maintenance of works and plant, less £2114 11s. 3d. received for old materials	100,703 0 9	
		£781,430 7 10
Co-partnership		18,159 4 3
Distribution of gas—		
Repair, maintenance, and renewal of mains and service-pipes	£32,347 9 4	
Salaries and wages of officers, including rental clerks	21,767 10 11	
Repair and renewal of meters	27,127 16 5	
Repair and renewal of stoves	27,496 18 4	
Repair and renewal of gas-fittings	23,270 18 2	
		132,010 13 2
Public lamps, labour and materials £14,394 6s. 9d., less £13,891 15s. received for the same		502 11 9
Rents, rates, and taxes—		
Rents payable	£1,579 6 6	
Rates and taxes	55,445 9 5	
		57,024 15 11
Management—		
Directors' allowance	£2,852 7 6	
Salaries of Secretary, Accountant, and clerks	4,465 8 3	
Collectors { Ordinary	5,840 9 8	
Collectors { Slot meter	11,744 10 8	
Stationery and printing	4,039 6 7	
General charges	12,405 3 10	
Company's Auditors	112 10 0	
		41,459 16 6
Miscellaneous—		
Law charges		1,294 9 11
Parliamentary charges		11 7 2
Bad debts		2,084 10 2
Stolen from 928 slot meters broken open		169 10 1
Superannuation, sick, and accident funds		12,120 7 7
National Insurance Act charges		2,073 12 4
Gas Referees and Official Auditor		239 13 6
Leasehold renewal fund		500 0 0
War Bonus and War fund		17,617 2 0
Total expenditure		£1,066,698 2 2
Balance carried to net revenue account		189,140 5 7
		£1,255,838 7 9

Receipts.

Sale of gas—		
Lady-day, at 2s. 4d. per 1000 feet	£437,530 1 10	
Midsummer, at 2s. 10d. per 1000 feet	350,584 10 3	
	£788,114 12 1	
Public lighting	12,590 15 10	
		800,705 7 11
Company's meters at rent: Ordinary, 94,941; slot, 277,102	£42,926 19 3	
Company's stoves at rent: Ordinary, 85,320; slot, 231,710; fires, 50,650	38,175 13 3	
Gas-fittings	49,175 0 10	
		130,277 13 4
Residual products—		
Coke, less labour and cartage	£202,691 17 7	
Breeze, " "	8,829 12 2	
Tar and tar products, less labour	50,304 8 11	
Sulphate of ammonia " "	61,489 15 10	
		323,315 14 6
Rents receivable		1,470 19 6
Transfer fees		68 12 6
Total receipts		£1,255,838 7 9

Total amount paid in salaries for half year, £46,427 11s. 10d.
" " " wages " £302,253 19s. 5d.

The following tables relate to working:—

Statement of Coal.

In Store Dec. 31, 1914.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1915.
Tons. 189,837	Tons. 534,331	Tons. 569,539	Tons. 1131	Tons. 153,498

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands. 6,936,706	Thousands. 116,345	Thousands. 6,510,378	Thousands. 6,710,883	24,834

Statement of Residual Products.

Description.	In Store Dec. 31, 1914.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1915.
Coke—tons	52,205	350,174	93,290	284,880	24,209
Breeze—tons	34,366	61,858	30,991	33,436	31,797
Tar—gallons	439,060	5,392,843	5,168,176	14,672	649,055
Ammoniacal liquor—butts	12,110	213,900	216,464	..	9,546

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £149,608; coke and breeze, £35,677; tar, ammonia, and products, £65,909; and sundry plant and stores, £351,651. The figures this time last year were: Coal, £137,573; coke and breeze, £60,276; tar, ammonia, and products, £71,078; and sundry plant and stores, £331,157.

A sum of £88,606, co-partnership bonuses and savings, has been deposited with the Company; and the total of the superannuation and guarantee funds is £80,245. The figures last year were £63,301 and £71,305.

COMMERCIAL GAS COMPANY.

Half-Yearly Report.

The following is the report for the first six months of this year, which the Directors of the Commercial Gas Company will present at the half-yearly meeting on Thursday.

The Directors submit the accounts for the half year ended June 30, 1915. The revenue account shows a net profit for the half year of £63,640 8s. 6d., which, added to the balance of £61,275 1s. 11d. brought forward from the previous half year, produces a net revenue balance of £124,915 10s. 5d. Deducting therefrom £8872 6s. 6d. for interest, there remains standing to the credit of the net revenue account a balance of £116,043 3s. 11d. available for dividend. The Directors recommend the payment of dividends at the statutory rates of £4 18s. 8d. per cent. per annum upon the 4 per cent. stock of the Company, and of £4 13s. 4d. per cent. per annum upon the 3½ per cent. stock, both less income-tax. Owing to the increase in the cost of coal and other raw materials, and the extra payments to the Company's workmen by reason of the war, the Directors have found it necessary to increase the price of gas from 2s. 4d. to 2s. 8d. per 1000 cubic feet as from the taking of meter indices at the Lady-Day quarter. The balance of the net revenue will be carried forward to the next half year.

William Graham Bradshaw, Chairman.

Gas-Works, Stepney, July 28, 1915.

The Accounts.

The accounts accompanying the report consist of the usual set of statements. They show that the paid-up stock on the 30th of June amounted to £996,405; that £1,076,875 had been added by conversion, making £2,073,280; and that £149,298 remained unissued out of the total authorized capital (including premiums) of £2,235,000. The total amount borrowed on the above-named date was £339,062 10s., and £135,937 10s. was added by conversion; making a total of £475,000, and leaving £79,226 to be borrowed out of the £550,000 authorized. Capital account receipts amount, with premiums, to £2,606,065 4s. 5d. The expenditure stands at £1,457,835 10s. 10d., with a nominal amount of £1,212,812 10s. added by conversion—together, £2,670,648 0s. 10d. There is thus a balance of £64,582 16s. 5d. carried to the balance-sheet. A sum of £11,218 16s. 1d. was expended during the half year on new and additional steamship, mains, services, stoves, &c.; but £1227 17s 9d. is credited for prepayment meters and fittings. The reserve fund amounted at the close of the half year to £41,328, and the insurance fund to £34,896.

The following statements relate to the working:—

Statement of Coal and Oil.

—	In Store Dec. 31, 1914.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store June 30, 1915.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coal	21,512	90,645	86,253	731	25,173
Oil—gallons . .	353,878	1,542,257	1,543,700	..	352,435

Statement of Residual Products.

Description.	In Store Dec. 31, 1914.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1915.
Coke—tons	4,331	53,908	6,620	49,427	2,191
Breeze—tons.	5,266	6,269	..	7,423	4,112
Tar—gallons.	434,610	1,153,497	..	1,171,029	417,078
Ammoniacal liquor—butts of 108 gallons	11,187	31,130	36,240	..	6,077
Sulphate of ammonia—tons	160	1,186	..	1,216	130

Statement of Gas Made, Sold, &c

Quantity Made.	Quantity Sold.		Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
1,910,687	23,811	1,728,290	1,780,761	3,826

The last statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, oil, &c., £26,863; coke and breeze, £1801; tar, ammoniacal liquor, sulphate of ammonia, &c., £8884; sundry stores, £40,639—total, £78,188. The figures this time last year were: Coal, oil, &c., £30,055; coke and breeze, £9584; tar, ammoniacal liquor, sulphate of ammonia, &c., £8620; sundry stores, £34,912—total, £83,171.

The following is the revenue account:—

Expenditure.

Manufacture of gas—		
Coal and oil, including dues, carriage, unloading, and trimming	£113,457 14 0	
Salaries of Engineer and officers at works . . .	3,436 8 2	
Wages (carbonizing)	11,045 15 0	
Purification, including labour	1,043 6 10	
Repair and maintenance of works and plant, materials and labour (less £320 17s. 3d. received for old materials)	24,719 19 11	
		£153,703 3 11
Profit sharing		2,668 15 7
Distribution of gas—		
Salaries and wages of officers (including rental clerks)	£5,984 16 7	
Repair, maintenance, and renewal of mains and services, material and labour	8,561 16 9	
Repair and renewal of meters	2,648 11 6	
,, ,, ,, ,, stoves	11,097 3 6	
,, ,, ,, ,, prepayment meters and fittings.	11,991 12 9	
Maintenance of mantles and fittings	1,243 9 9	
		41,528 0 10
Public lamps—lighting and repairing.		2,534 12 2
Rent, rates, and taxes		17,646 7 1
Management—		
Directors' allowance	£1,250 0 0	
Company's Auditors	75 0 0	
Salaries of Secretary, Accountant, and clerks . .	1,119 16 8	
Collectors' salaries and commission	1,561 13 1	
Prepayment meter collection	3,779 9 10	
Stationery and printing	994 12 1	
General charges.	2,261 12 4	
		11,042 4 0
Bad debts		298 6 2
Law and parliamentary charges		107 5 11
Superannuations and allowances and Workmen's Benefit Society, &c.		2,469 11 3
Official officers, &c.		100 10 10
National Health and Unemployment Insurance . .		527 9 11
Total expenditure		£232,626 7 8
Balance carried to net revenue account. . . .		63,640 8 6
		£296,266 16 2

Receipts.

Sale of gas—		
Per meter (number in use, 114,674) at 2s. 4d. and 2s. 8d. per 1000 cubic feet	£212,133 7 5	
Public lighting and under contracts	4,797 16 6	
	£216,931 3 11	
Less discounts and allowances	7,533 15 10	
		£209,397 8 1
Rental—		
Meters (24,270)	£2,925 5 9	
Stoves (79,851)	12,809 3 3	
Prepayment meters and fittings (89,716)	18,378 3 2	
Maintenance of mantles and fittings	777 3 0	
		34,889 15 2
Residual products—		
Coke, less £3965 8s. 7d. for labour	£31,308 8 8	
Breeze, less £959 2s. 5d. for labour	1,277 15 7	
Tar	8,747 3 6	
Ammoniacal liquor and sulphate of ammonia . .	10,623 15 2	
		51,957 2 11
Miscellaneous receipts—		
Rent receivable	—	
Transfer fees.	22 10 0	
		22 10 0
Total receipts		£296,266 16 2

An Interrupted Gas Supply at Calgary.

On Saturday, June 26, the "Calgary Daily Herald" issued an extra edition, consisting of a single page of print, on pink paper, headed with this announcement: "Owing to the failure of the gas supply, the 'Herald' composing-room and the mechanical departments are unable to run this morning. This issue, which is being distributed free, is simply for the purpose of informing the public as to the gas situation." The cause of the trouble was a great tornado, which, in addition to killing and injuring various persons, had extensively damaged the gas-mains. The President of the Gas Company (Mr. Eugene Coste) stated that several thousand feet of gas-main had been washed out between Sandstone and Okotoks, and that the Company hoped to have repairs made and the supply on again by 8 o'clock that night [the tornado was on the previous evening]. He added that a special train, with a repair gang and the necessary new pipe [in charge of General Superintendent Pearson], had been sent out, but that there was some doubt as to when they would reach the scene of the break, owing to the fact that the Canadian Pacific Railway line had also been damaged. It is to be hoped that the special train reached its destination without hindrance, and that the restoration of the gas supply was not postponed in consequence of the alternative course of employing teams from Sandstone having to be adopted.

◆

Circular Gas-Fires.—Since the paragraph was written referring to the new circular gas-fire introduced by Messrs. Rogers and Cadwallader [p. 177], our attention has been called to an old list issued by Messrs. John Wright and Co., in which a circular fire, also with upright radiants, is illustrated. The name given to this gas-fire is the "Momiji;" and it is on a stand, and has a hood, very similar to the one referred to in our columns. Whether the internal construction is the same, we have no means of telling. The illustration of the "Momiji" fire does not show a flue connection; but, of course, there is not the slightest reason why one should not be provided. This fire produced by Messrs. John Wright and Co. has, we are informed, been made and sold for many years past for use in various parts of the world.

COKE-BUNKERS AT THE GLASGOW GAS-WORKS.

Reinforced Concrete Construction at Dalmarnock.

In the number of the "Builder" for the 16th ult., there appeared some particulars of a general scheme of coke-bunkers erected at the Dalmarnock Gas-Works of the Glasgow Corporation, to the design and under the supervision of Mr. Alex. Wilson, M.Inst.C.E., the Manager of the Gas Department. The reinforced concrete construction was by Messrs. Johnson, Clapham, and Morris, Limited, of Manchester, and was carried out by them on their "Lattice" and "Keedon" system. We are indebted to our contemporary for the following account of the work and for the illustrations by which it is accompanied. For additional particulars as to the method of construction, readers may be referred to the paper by Mr. Thomas Carmichael, read before the Scottish Junior Gas Association (Western District), which appeared in the "JOURNAL" for March 23 last, pp. 752, 753.

The advantages of reinforced concrete over steel and timber construction can probably be realized more fully in the building of coke-bunkers than any other type of structure, on account of its fire-resisting qualities and lack of maintenance costs. A very good example of a reinforced concrete coke-bunker is provided by the scheme which has just been completed at the Dalmarnock Gas-Works of the Glasgow Corporation, to work in conjunction with the new vertical retort plant that has been installed there.

To appreciate the value of the material employed, it must be understood that the coke is deposited in the bunkers after being drawn from the retorts; and although water is applied to extinguish the fire, there is a great tendency for the coke to rekindle. Thus a fire-resisting material is absolutely necessary. If steel is used, buckling and distortion are unavoidable; and the bunker in consequence becomes seriously damaged. But this distortion does not occur with reinforced concrete; and the latter material is therefore becoming almost universal with managers and engineers dealing with gas-works.

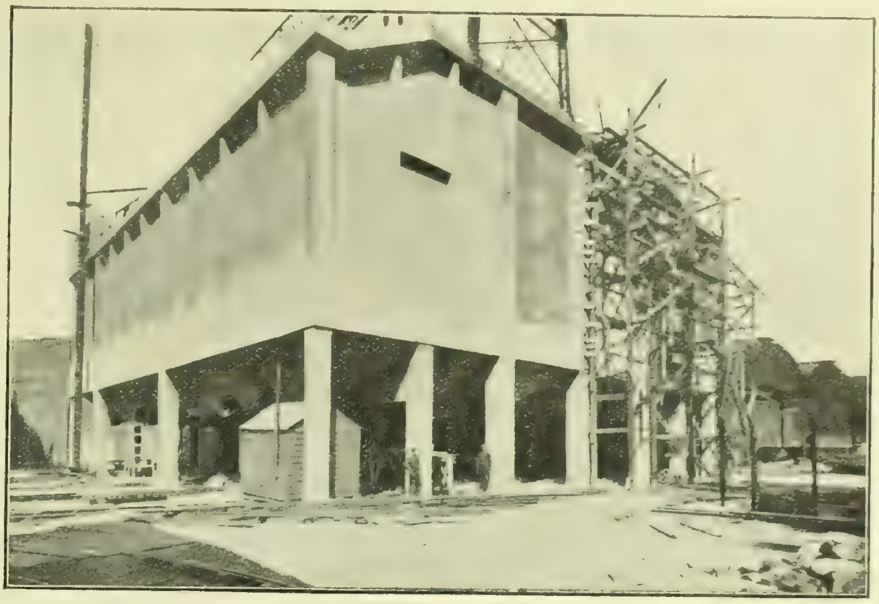

Fig. 1.—Coke-Bunker at the Dalmarnock (Glasgow) Gas-Works.

The over-all dimensions of the Glasgow bunker are 104 feet long by 84 feet wide and 48 feet high fromthe rail level; and it has a total capacity of about 4000 tons. It is divided into two sections by a transverse wall; and these sections are in turn divided into four subsections by other walls, to enable stores of coke of four different sizes being stocked ready for delivery. A general view of the bunker is shown in fig. 1. It will be seen that it is supported by columns to allow of the passage of traffic under the building; and these columns are all constructed in reinforced concrete of sizes varying from 18 inches square to 36 inches square.

The loads on the main columns are over 300 tons each; and as the bearing capacity of the soil could not safely be considered as more than 1 ton per square foot, special continuous reinforced footings were arranged under each row of columns.

The hopper bottoms, which are sloped at an angle of 45 degrees, are formed with reinforced concrete, 8 inches thick; and the outlets are placed at a height of 10 feet above rail level, to allow railway waggons and carts to pass directly under the hopper valves, so that the coke is discharged directly into them.

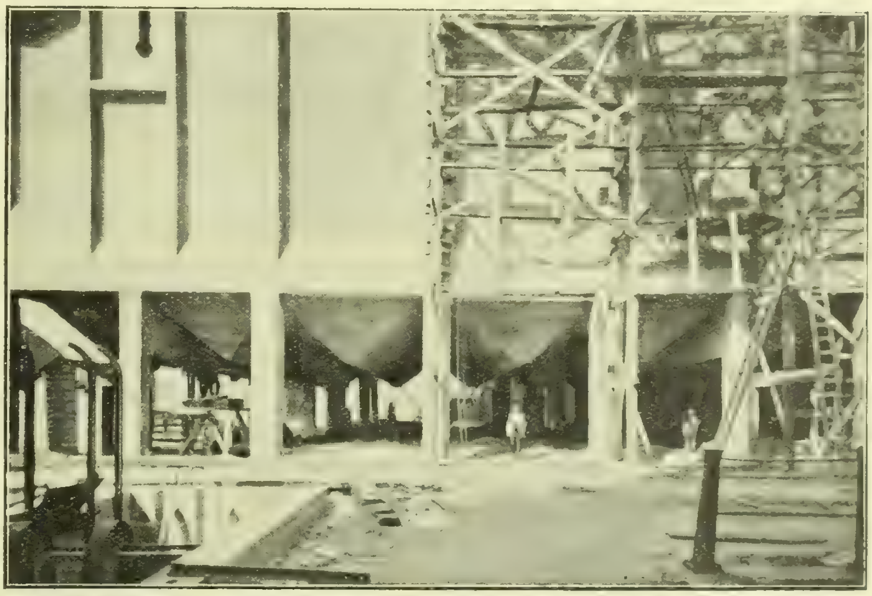

Fig. 2.—Coke-Bunker at Glasgow: A View showing the Hoppers.

Owing to the compartments being of varying sizes, and the divisional walls being exceptionally long without a break, they were stiffened by the introduction of vertical members connected by cross ties and bracings from side to side of the bunkers.

The external walls are also stiffened by piers, which project on the outside at regular intervals throughout the length; and these piers are connected to horizontal beams at the top and bottom of the wall, thus forming recessed panels. These improve the appearance of the structure while providing efficient and economical construction. The projecting piers can be seen in figs. 1 and 2; and the latter view also shows the hoppers at the bottom of the bunker.

Société Technique du Gaz en France.

It was mentioned in the "JOURNAL" some weeks ago that the Committee of this Society had been considering the question of holding the annual congress this year, and had come to the conclusion that, if it could not be held some time in August, it would have to be abandoned. Circumstances arising out of the present condition of affairs in France necessitate the constant personal supervision of gas managers of the works under their control; and therefore the Committee have decided not to hold the congress, but to defer it till next year. The "Transactions" for the past year will, however, be published in due course; and in order to avoid any break in the series of volumes, one will be issued containing a Roll of Honour of the gas industry as well as some interesting features of the current year—such as the supply of coal to gas-works, the utilization of tar for the manufacture of explosives, &c. It may be remembered that the issue of the Society's organ, the "Journal des Usines à Gaz," was interrupted by the outbreak of war; but it will now appear regularly on the 5th and 20th of each month, as before.

POWER PRODUCTION.

The "£ s. d." of the Question.

By H. C. Widlake, M.J.Inst.E., of the Plymouth and Stonehouse Gaslight and Coke Company.

(Concluded from p. 186.)

The British Westinghouse High-Power Gas-Engine.

Foremost among firms whose excellent work has given such an impetus to the manufacture of the high-power gas-engine in England may be named the British Westinghouse Company, of Trafford Park, near Manchester, whose Board of Directors, some three years ago, considered the advisability of taking up the manufacture of the slow-moving horizontal type of gas-engine as used on the Continent. In view, however, of the small demand for these engines, and the heavy capital outlay in laying-down the necessary manufacturing plant, and also the success which had already attended the Company's efforts in the direction of the development of the high-speed gas-engine, it was decided to go forward in the same direction as that in which efforts had already been directed—namely, the manufacture of the vertical tandem engine.

The Westinghouse tandem gas-engine is arranged with the lines of cylinders mounted vertically side by side. Each line comprises two single-acting cylinders mounted one on top of the other, with their pistons coupled and connected to one crank. Each cylinder operates independently, and goes through the ordinary Otto four-cycle stroke. Compared with the use of a single cylinder of large dimensions the advantages gained by the above described construction are of great importance to the power user, and may be summarized as follows:—

(*a*) An exceedingly even turning movement, which places this type of engine on a par with the triple-expansion steam-engine, or even, so far as practical considerations are concerned, with the electric motor or steam-turbine.

(*b*) A limitation of piston diameter and the consequent elimination of water-cooled pistons and their consequent complication.

(*c*) Maximum economy as regards floor space, and the consequent saving in the cost of foundations.

(*d*) The engine, being essentially a high-speed machine, the moving parts are relatively small, and there is no necessity for the heavy and expensive overhead cranes which are such a feature of slow-speed plants.

The advantages claimed by the Westinghouse Company for this type of engine are: Low gas consumption; compact design, allowing a maximum power to be installed in a given space; steady turning movement, giving a cyclic regularity equal to the best high-class steam-engine; reliability equal to steam installations; maintenance as low as the best steam plant; and continuous rating. The makers claim, in addition, that the engine is easy to start; that, being enclosed, it is clean, and allows cleanliness in the engine-room; and that the lubricating oil consumption is extremely low.

Among the many interesting plants driven by this class of engine the following examples may be quoted.

Important Installations of Westinghouse Engines.

At the Hollins Mill Company, Marple, there is an installation consisting of a 750 B.H.P. 200 R.P.M. engine, giving a good example of a gas-engine driving a cotton mill through ropes—the rope pulley forming the engine flywheel. There are no friction clutches or other devices whatever to ease the load at starting. The engine, as stated above, has now been installed for over three years. A comparison of the cost of running between this portion of the mill driven by the gas-engine, and another portion steam driven, shows that the steam cost is a little more than twice as much as the gas-engine cost. At the works of the Castner Kellner Company, in Runcorn, there are two 1000 H.P. engines, and four 750 B.H.P. engines, direct coupled to direct current generators supplying current for electrolytic work. The service is exceptionally severe; and it would appear that the engines have met the work satisfactorily, as the installation has been extended from the initial one of four sets to the present one of six.

There are also Westinghouse installations at Messrs. Cadbury Bros.; Messrs. Cammell, Laird, and Co.; Enfield Cycle Company; Messrs. Pilkington Bros., St. Helens; Messrs. Cochrane and Co., Middlesbrough; the Wednesbury Corporation; Littleton Collieries; and Messrs. Tweedales and Smalley. From this it will be seen that these engines are being used for practically every class of industrial work as well as municipal service. They are dealing successfully with the parallel running of alternators, and are driving direct-current generators with steady lighting loads, as well as with the rapidly fluctuating loads occurring in traction and some classes of industrial service. The merits of this particular engine, which is built in sizes of from 100 to 1000 H.P., are well worth investigating by anyone interested in gas plant.

Fig. 3 is an example of a typical Westinghouse vertical tandem engine working on town gas, and direct coupled to an alternator; while fig. 4 shows the private power station of a very well-known Midland engineering firm, the gas for which is generated in Dowson producers using gas coke for fuel. This plant has been in service since about 1902, and at present supplies 54 motors aggregating 1138 H.P.; the individual powers ranging from 6 to 100 H.P.

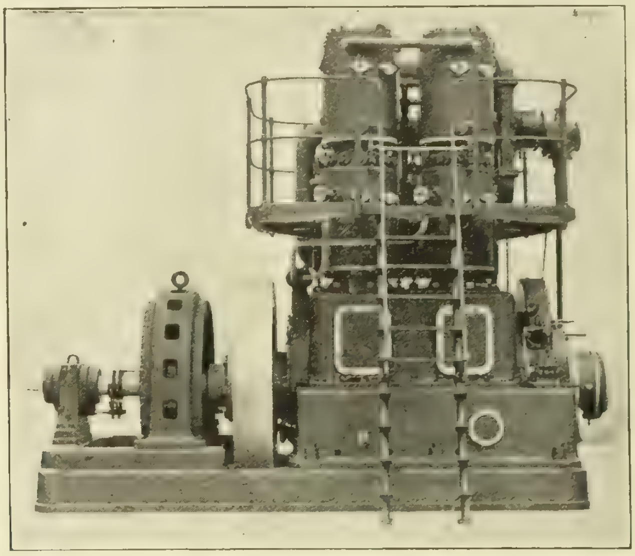

Fig. 3.—Westinghouse Tandem Gas-Engine Working on Town's Gas.

An Interesting Test.

A particularly interesting test was recently carried out upon a Westinghouse horizontal gas-engine at the Neepsend Gas-Works, Sheffield, and by the courtesy of Mr. J. G. Walthew, of the British Westinghouse Company, the author is privileged to include these particulars in this article.

The engine was guaranteed to have a consumption not exceeding 9500 B.Th.U. per brake-horse-power, and was tested by the engineering staff of the Sheffield Gas Company. Continuously taken calorimeter readings were used to decide the heat-value of the gas, while its quantity was measured through a standard meter, and a brake load applied to a special pulley fitted upon the crank-shaft of the engine determined the actual output.

Particulars of Engine.

Date of tests	May 2, 1913.
Type of engine	"Industrial," size S—9.
Power	32 max. B.H.P., 30 B.H.P. normal working load.
Speed	180 revs. per minute.
Bore of cylinder	11 inches.
Stroke of piston	19 inches.
Barometer pressure	29·8 inches mercury.

Full Load Test.

Average load during test	29·5 B.H.P.
Total gas used per hour (at 65° Fahr. and 0·75 in. water pressure	530 cubic feet
Total gas used per hour (corrected for 60° Fahr. and 30 in. mercury	523 ,, ,,
Cubic feet of gas per B.H.P. hour = $\frac{523}{29{\cdot}5}$	17·7 ,, ,,
Heat units per B.H.P. hour (gas 530 B.Th.U. net value) 17·7 × 530	9381 B.Th.U.

Three-Quarter Load Test.

Average load during test	24·7 B.H.P.
Total gas used per hour (at 66° Fahr. and 0·75 in. water pressure)	450 cubic feet
Total gas used per hour (corrected for 60° Fahr. and 30 in. mercury	443 ,, ,,
Cubic feet of gas per B.H.P. hour = $\frac{443}{24{\cdot}7}$	18 ,, ,,
Heat units per B.H.P. hour (gas 530 B.Th.U. net value) 18 × 530	9540 B.Th.U.

Half-Load Test.

Average load during test	17·5 B.H.P.
Total gas used per hour (at 60° Fahr. and 0·75 in. water pressure)	360 cubic feet
Total gas used per hour (corrected for 60° Fahr. and 30 in. mercury)	354 ,, ,,
Cubic feet of gas per B.H.P. hour = $\frac{354}{17{\cdot}5}$	20·2 ,, ,,
Heat units per B.H.P. hour (gas 530 B.Th.U. net value) 20·2 × 530	10,706 B.Th.U.

It will be observed that the consumption of full-load test was below that guaranteed; while the three-quarter and half-load tests were equally satisfactory. At 10d. per 1000 cubic feet, the power costs for this particular engine work out as follows:—

Full load	0·177d. per B.H.P. hour.
Three-quarter load	0·180d. ,, ,, ,,
Half load	0·202d. ,, ,, ,,

Fig. 5 is from a photograph of an engine of the standard type manufactured by the Westinghouse Company for industrial purposes. The main bearings of this engine are fitted with ring lubrication, while a pump fitted to the side of the engine, and operated by the side shaft, ensures a positive feed to the cylinder, piston, and gudgeon pin.

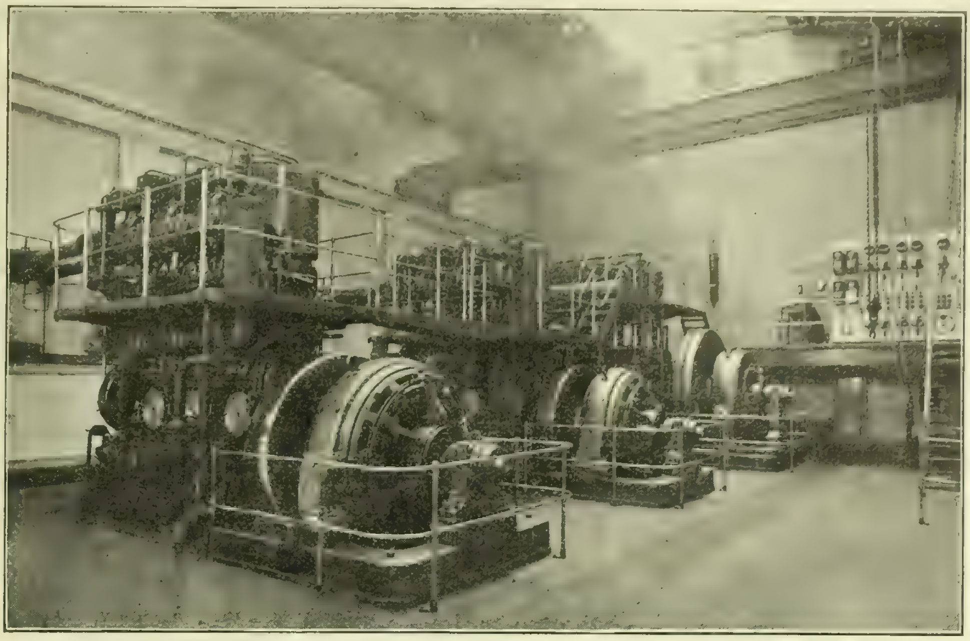

Fig. 4.—LARGE WESTINGHOUSE POWER PLANT WORKING ON GAS-COKE PRODUCERS.

It has been claimed in connection with this type of engine that the governing gear is of the simplest description, and while the above tests cannot but convince the reader of the efficiency of the engine, a reference to fig. 6 will certainly substantiate this claim for the governing gear made on the ground of simplicity.

An inlet cam on the side shaft operating upon A roller lifts a quadrant lever, upon the quadrant of which rests the lower end of the radius rod operating the inlet valve. The position of this rod on the quadrant—viz., its distance from the fulcrum on which the quadrant lever works—is regulated by the centrifugal governor of the engine, and consequently the amount of mixture admitted to the engine increases as the lower end of the radius rod recedes from the pin C. It is claimed that this system of governing—that is, by regulating the admission of gas and air direct at the inlet valve, a steadier turning movement is produced—the engine works more silently, while the wear and tear are considerably reduced. The impulses given to the piston vary in strength according to the amount of mixture entering the cylinder, while at the same time the proportion of gas and air is kept approximately constant irrespective of the load, thus ensuring reliable ignition under all conditions. It will be observed from the photograph that the simplicity of the design enables the governing gear to be kept clear of the casing containing the gas and air valves, thus facilitating the withdrawal of the casing for the purpose of examination or grinding in.

It has been claimed that the gas consumption is less with an engine governing on the hit-and-miss principle, but in the author's opinion this claim only holds water below half-load. With the hit-and-miss system, the compression is constant while the impulses are intermittent, and a heavy explosive stroke is followed by a series of misses according to the working load. This system of governing involves the use of heavy fly-wheels in order to compensate for the irregular turning movement; while unless special silencing arrangements are provided, the exhaust is noisy and objectionable. The use of variable admission governing gives excellent economy at all economical load factors, and enables an internal combustion engine to operate as smoothly as a steam-engine.

In presenting the foregoing data, the writer desires to express his thanks to Mr. Edward G. Hiller, the Chief Engineer of the National Boiler and General Insurance Company, for the courteous permission which has enabled him to quote from, and use data contained in, that gentleman's able paper on "Power Production in the United Kingdom," read in January of last year before the Manchester Association of Engineers.

His thanks are due also to Messrs. Crossley Bros., of Openshaw, Manchester, for particulars concerning the Vennell-Coster patent coupling, and to the British Westinghouse Engineering Company, of Trafford Park, Manchester, for details as to the vertical gas-engines for whose manufacture the firm are famous.

In this latter connection, the author also desires to express his appreciation of the courtesy of Mr. J. G. Walthew, of the British Westinghouse Company, whose permission has enabled him to make use of the tests of the engine used at the Neepsend gas-works, together with particulars of same, given in the able paper read by Mr. Walthew in the latter part of last year before the Manchester Association of Engineers.

In conclusion, the author desires to express his obligation to Mr. P. S. Hoyte, the Chief Engineer to the Plymouth and Stonehouse Gaslight and Coke Company, for the able assistance and collaboration rendered him in the compilation of this article, and for the courteous permission which has enabled him to lay same before "JOURNAL" readers.

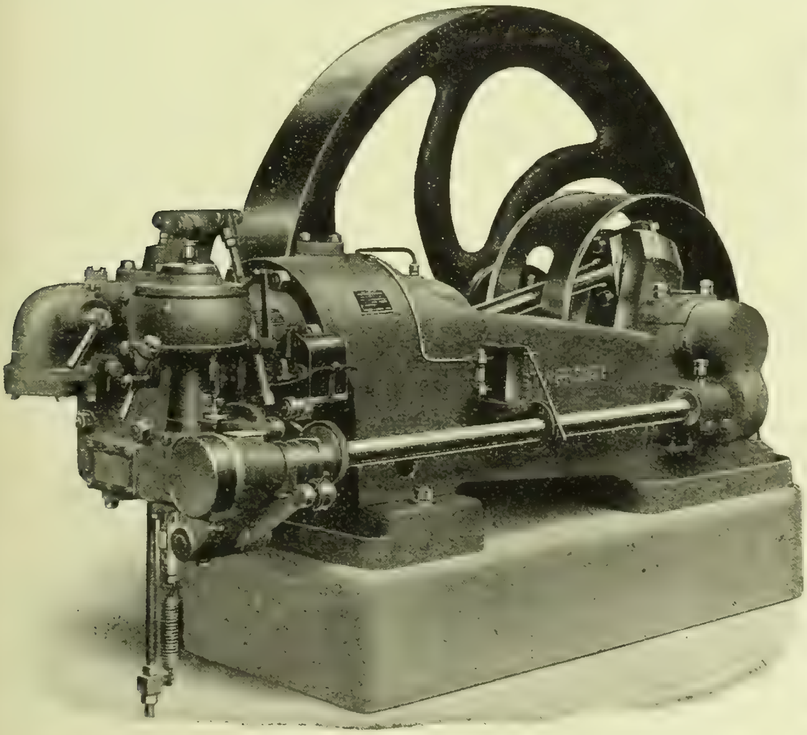

Fig. 5.—The Westinghouse Company's Standard Type of Engine.

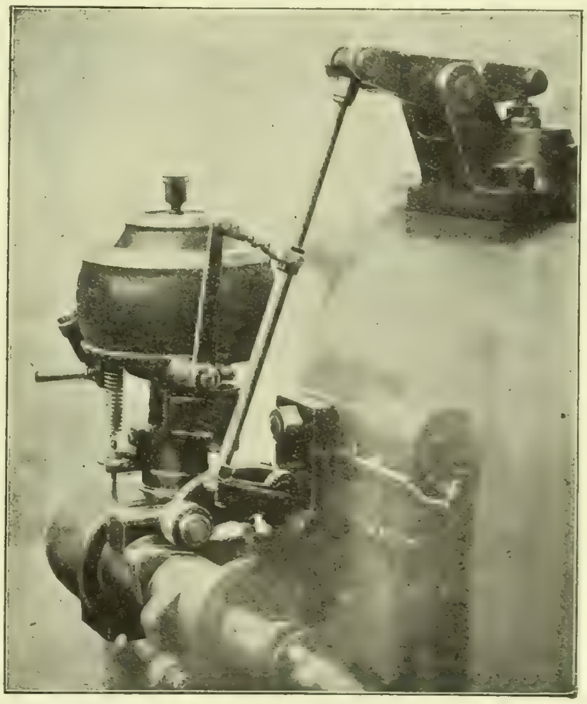

Fig. 6.—Governing Gear of the Westinghouse Gas-Engine.

DETERMINATION OF PRUSSIAN BLUE IN WASHER SLUDGE AND SPENT OXIDE.

The following is an abstract translation of an account given in the "Zeitschrift für angewandte Chemie" in September last of a research undertaken by Dr. G. Anderson, of the Hanover works of the Imperial Continental Gas Association, when he was working under Professor W. Eschweiler at the Technical College at Hanover.

Differences frequently arise in results of determinations of the cyanogen in cyanide washer sludge. The method of determination worked out by Dr. Bueb, as employed at the "Residua" Chemical Works, which deals with the sludge produced in Bueb washers on German gas-works, is as follows: 50 grammes of the well-stirred sludge is boiled with 100 c.c. of a solution of caustic potash of 1·26 specific gravity and about 200 c.c. of water, in order to get rid of the ammonia. When cold, the whole is made up to 1010 c.c.; 10 c.c. being allowed for insoluble matter. After agitation, the liquid is filtered through a dry filter and 25 c.c. of the filtrate is taken, 50 c.c. of water and 10 c.c. of dilute sulphuric acid (100 c.c. 1·84 acid made up to a litre) are added, and it is titrated with solution of sulphate of zinc, of which 1 c.c. corresponds with 0·01 gramme of potassium ferrocyanide, $K_4Fe(CN)_6 + 3H_2O$. The end point of the reaction is ascertained by the drop method, using filter paper and 1 per cent. solution of ferric chloride. The drop of ferric chloride solution and the drop of liquid under test are placed on the paper so that only their edges touch. The end point is, however, a subjective phenomenon, and is much affected by the method of lighting. Consequently differences of tenths per cent., making 10 per cent. of the total, readily occur with different analysts.

The end point of the titration is affected by addition of sulphuric acid and by dilution; but errors arising from these causes can be offset by taking, in the standardization of the zinc sulphate solution, the quantities of acid and water which are prescribed for the titration of the cyanogen sludge. Sulphocyanide also is formed to some extent from the sulphur present in spent oxide when the liquid is boiled as directed for thirty minutes. After thirty minutes' boiling the ferrocyanide may be underestimated on this account by about 1 per cent. The main disadvantage of the method is, however, the difficulty in recognizing the end point of the titration.

Knublauch's method of determining cyanogen has been shown by earlier investigators to be inexact. A method which is commonly used is Drehschmidt's, which is as follows: 10 grammes of spent oxide is brought into a half-litre flask with about 150 c.c. of water and 1 gramme of ammonium sulphate. Then 15 grammes of mercuric oxide are added. The whole is boiled for about a quarter of an hour. After cooling, ½ c.c. to 1 c.c. of a solution of mercurous nitrate is added, with agitation, and ammonia until precipitation ceases to take place. The contents are then made up to the mark on the flask, and 8 c.c. of water (or 1 c.c. for cyanogen sludge) is added to make up for the volume of solid material. From the filtrate, 200 c.c., which corresponds with 4 grammes of spent oxide, are transferred to a 400 c.c. flask; at least 6 c.c. of liquid ammonia of ·91 specific gravity and 7 grammes of zinc dust are added; and, after repeated agitation, 2 c.c. of a 30 per cent. solution of caustic potash are added and the contents of the flask made up to 400 c.c. After thorough agitation they are filtered through a dry double filter. Of the filtrate, 100 c.c. (corresponding with 1 gramme of the spent oxide) are added to excess of decinormal silver solution in a 400 c.c. flask and acidified with dilute nitric acid. After agitation and settling, the contents are made up to the mark, agitated, and filtered through a dry filter. Of the filtrate, 200 c.c. are then titrated back with one-twentieth normal solution of ammonium thiocyanate, according to Volhard's process. The amount of the solution consumed corresponds directly to the excess of silver, and is deducted from the quantity of the latter used. Of decinormal silver solution, 1 c.c. corresponds with 0·002598 gramme of CN or 0·004771 gramme $Fe_7(CN)_{18}$.

The author investigated Drehschmidt's process on a solution of potassium ferrocyanide of known strength. Following Drehschmidt's directions, the consumption of silver nitrate solution corresponded with 96·25 per cent. of the quantity theoretically required. In two subsequent trials the liquid was boiled for thirty minutes (instead of the prescribed fifteen minutes), and the results were 99·18 and 99·23 per cent. of the theoretical quantity. In some subsequent trials thirty minutes' boiling was therefore adopted. In order to ascertain whether the mercurous nitrate got rid of chlorine, which would affect the subsequent determination of cyanogen by titration, the author made a trial in which he added 0·1 gramme of sodium chloride. The chlorine was not completely taken up even by an addition of 6 c.c. of mercurous nitrate solution. Three tests gave 125·7, 111·8, and 116 per cent. of the theoretical value.

In practice, such high results would not usually occur, as when the method is applied to cyanogen sludge it gives about the same results as other methods of determination. With Drehschmidt's method loss occurs through sulphocyanide formation. Two analyses, in which 1 gramme of sulphur was added to the potassium ferrocyanide solution, gave 94·94 per cent. and 96·88 per cent. of the theoretical value. The sulphocyanide unites with the mercurous salt, and is thus lost. Sludge from a cyanogen washer, tested according to Drehschmidt's method, but with thirty minutes' boiling, showed, in five successive determinations, 10·46, 10·19, 10·65, 10·35, and 10·55 per cent. of prussian blue. The mean of these figures—viz., 10·45 per cent.—agrees with the results found by the Feld-Witzeck method. The precautions necessary in the use of Drehschmidt's method are therefore that the boiling must be extended to thirty minutes, and the reagents must be free from chlorine.

The Feld-Witzeck method, as described by Witzeck, is as follows: Two grammes of spent oxide, or 0·5 gramme of washer sludge, are triturated for five minutes in a mortar with 1 c.c. of solution of ferrous sulphate (278 grammes per litre) and 5 c.c. of eight times normal solution of caustic soda (320 grammes per litre). Then there is slowly added, with constant stirring, 30 c.c. of three times normal solution of magnesium chloride; and the whole is washed into a 700 c.c. distillation flask with as much hot water as will bring the volume to about 200 c.c. After boiling for about five minutes, 100 c.c. of decinormal solution of mercuric chloride (27·1 grammes per litre) is poured into the boiling liquid, which is kept at the boil for ten minutes. The flask is then connected with a condenser, and 30 c.c. of four times normal sulphuric acid (392 grammes H_2SO_4 per litre) are run in through a tap funnel passing through a rubber plug, and distillation kept up for 20 to 30 minutes. The distillate is collected in a conical beaker containing 20 c.c. of twice normal solution of caustic soda (80 grammes per litre); the flask being closed with a rubber plug with two holes, through one of which the delivery tube of the condenser passes while the other carries absorption bulbs charged with caustic soda solution to exclude air from the system. After the addition of 5 c.c. of one-fourth normal solution of potassium iodide (41·5 grammes per litre), the distillate is titrated; the end point being shown by a milky yellow cloudiness. One c.c. of decinormal solution of silver nitrate (17·0 grammes per litre) will represent 0·009548 gramme of prussian blue.

The author checked the accuracy of this method, when carried out according to the foregoing instructions, on a solution of known strength of potassium ferrocyanide, and obtained erratic results, which were always low. He found that cyanide of mercury was not completely decomposed by sulphuric acid alone, and that the presence of a large excess of soluble chloride was necessary in order to secure complete decomposition. He then made a number of tests on the solution of potassium ferrocyanide, using 50 c.c. of three times normal solution of magnesium chloride instead of the 30 c.c. prescribed by Witzeck, and obtained results so little below the theoretical values that the deficiency was no more than might be expected from the inevitable departure of the salt from its theoretical composition. It is to be observed that if the boiling with magnesium chloride is extended beyond five to ten minutes a loss ensues, and a low result is obtained. With pure ferrocyanide and washer sludge it is immaterial whether the material is treated with the eight times normal solution of caustic soda in the cold or in the hot; but with spent oxide cold treatment is preferable, as heat is liable to produce sulphocyanide.

A comparison of the three methods on a sample of washer sludge showed that the Feld-Witzeck method gave the highest and most consistent results; that Drehschmidt's method (which, moreover, requires costly reagents) gave very variable results; and that Bueb's method gave concordant, but rather low, results. The Feld-Witzeck method has therefore been adopted for use for the past two years in the Hanover Gas-Works and the works by which its sludge is bought, and has worked satisfactorily.

About 20 grammes of sludge are weighed out exactly and then made up to 100 c.c. in a measuring flask, from which, after thorough agitation, 10 c.c. are taken and triturated for 5 minutes in a glass mortar with 1 c.c. of normal solution of ferrous sulphate and 5 c.c. of eight times normal solution of caustic soda. Then 50 c.c. of three times normal solution of magnesium chloride are added with constant stirring, and the whole is washed into a flask—the volume of liquid being brought to about 200 c.c. After boiling for 5 to 10 minutes, 100 c.c. of boiling decinormal solution of mercuric chloride are poured into the boiling liquid, and the boiling continued for ten minutes. The flask is then connected with the condenser, 30 c.c. of four times normal sulphuric acid are added, and the liquid is distilled for 20 to 30 minutes. The distillate is collected in 20 c.c. of twice normal solution of caustic soda. If it is cloudy, 0·5 gramme of lead carbonate is added to it in a measuring flask, which is filled to the mark, and an aliquot portion is taken for the titration, after the precipitate has been filtered off. The titration is carried out according to Liebig's method with decinormal solution of silver nitrate and the addition of 5 c.c. of one-fourth normal solution of potassium iodide. The appearance of a yellowish milky cloudiness indicates the end of the reaction.

The imports of "Solar" gas oil from Jan. 1 to June 28 amounted to 43,916,980 gallons. The total imports of all grades of oil amounted to 298,467,000 gallons.

We have received from Messrs. Constable and Co., Limited, a copy of "High Power Gas-Engines," by H. Dubbel. The book has been translated from the German, and edited and expanded so as to include British engines and British practice, by Mr. F. Weinreb. Pending a fuller notice of the work, it may be mentioned that the purpose of it is to deal with the theory, principles of operation, and most important constructional features of large four-cycle and two-cycle gas-engines.

A REMARKABLE SPARROW'S NEST.[*]

BIRD LIFE AND GAS.

By Frank Bonnett, of Reading.

The pair of house-sparrows which built their nest this summer in the top of one of the street gas-lamps at Reading—in the pyramidal space formed by the flat reflector near the top of the lamp and the four-sided sloping roof above it—have contributed a very eloquent testimonial to the hygienics of gas lighting. Had a test been carefully arranged to prove the innocuous effect of the vapour given off by a gas-burner in a confined space, no more convincing proof of its harmlessness, even under the most severe conditions, could have been brought forward. The products of combustion in this type of lamp pass directly through the hole in the centre of the reflector; so that any living creature within the space above would be subjected to the full current of the vapour and the induced air draught. Yet neither the sitting bird nor her eggs appear to have taken the slightest harm.

This is one interesting point; but there is another—namely, in regard to the question of heat. The temperature of the space in which the sparrow's nest was built has been carefully taken; and the thermometer showed that, after the lamp had been burning for two hours, a temperature of no less than 180° Fahr. was reached in this space. In other words, the eggs and the bird sitting upon them at night would seem to have been subjected to a heat within 32° of boiling point.

The history of this remarkable nest is as follows: For some time previous to an investigation of the lamp being made, the lamplighter had noticed that a pair of sparrows were building in the space above the reflector. The birds had been seen carrying in their nesting material, which must have been a feat of some difficulty seeing that all of it had to be conveyed through the narrow space between the roof of the lamp and the lower rim of the circular canopy with which it is surmounted. The building must thus have taken an exceptionally long time; and it redounds to the birds' credit that they completed their task with the utmost tidiness. The material used consisted mainly of grass, both green and withered; and in addition to the customary lining of feathers, there were a few bits of stuff, such as flannel shreds, string, &c. The whole formed a very inflammable collection; but although the edges of the nest were much charred, the centre was in no way affected by the great heat to which it must have been daily (or, rather, nightly) subjected.

The nest, most unfortunately, was removed by one of the Gas Company's workmen when it contained five eggs; and these upon examination proved to be in a partly incubated condition—the chicks within them being clearly formed. The eggs had probably been incubated for some five or six days; but as they were not examined until about a fortnight afterwards, it was not possible to be quite exact on this point. Apparently, however, there had been no interruption to the ordinary process of hatching, and there can be but little doubt that the young birds would have emerged in due course. It is a thousand pities that the nest was molested; for it would have been most interesting to watch the final result of this somewhat rash experiment. For example, supposing the birds had been successfully reared, would their parents have managed to show them the way out of their peculiarly situated nursery?

It has been assumed above that the hen sparrow, following her natural instinct, sat upon her eggs during the night; but it is, of course, possible that she found the heat too great after the lamp had been lighted for some time, and vacated the nest until the lamp was extinguished each morning, when she could resume her labours under conditions of greater comfort. Supposing she continued to incubate at night as well as by day, to what heat must the eggs have been subjected? This is another interesting problem. But even without the bird's assistance, the eggs would have been "kept going" by the heat of the lamp—indeed, it is remarkable that the latter did not, apparently, do its work too thoroughly. It appears to be established that eggs can stand a far greater heat than that usually employed in artificial incubators without taking any harm so far as their hatching possibilities are concerned; for had the temperature been too much for them, they would have been spoiled at the very commencement and there would have been no sign of chick development. One wonders whether the eggs would have hatched any sooner for being subjected to a heat so far above the normal!

The fact that gas, when employed for lighting under ordinary conditions, is not only harmless but actually beneficial to bird-life has, of course, long since been demonstrated. Some years ago gas lighting was installed in the "Rare Birds House" at the Zoological Gardens, Regent's Park, with the result that the system was found to be satisfactory in every way. Not only have the birds thrived, but their longevity has been perceptibly increased. The introduction of artificial light enables the birds, whose digestions are very rapid, to be fed during the long hours of darkness; and this has undoubtedly been of great benefit to them. At the same time, it is fair to assume that the improvement in the results obtained is largely due to the better circulation of the air brought about by the use of gas.

For some reason or other there appears to be an increasing fondness among birds for lamps as nesting places; for an unusual number of such cases have been reported this year. Mr. F. Primrose Stevenson, of Sutton, Surrey, writes to the "Selborne Magazine" about a blue tit's nest built inside the hollow standard below a gas-lamp at that place. He adds: "Immediately above is the bye-pass, and once every twenty-four hours the lamplighter inserts his stick over the nest-hole to light the incandescent burner, and for several hours afterwards a fierce glare beats down upon the little family of tits." The same writer states that exactly similar nests have been noted by him this year at Leatherhead and also at Hackbridge, at both of which places the gas-lamps and standards employed are practically similar to those at Sutton. In the "Great Western Railway Magazine" for July there also appears a description of a blue tit's nest at Bedwyn Station, with three photographs showing one of the parent birds taking food to the young. The lamp in this case is an oil one.

In none of these instances, however, are there any such remarkable features as those associated with the sparrow's nest at Reading. One can but hope that the same pair of sparrows, or another, will make a similar experiment at some future time, when it will be most interesting to note what eventually happens.

AUTOMATIC OPERATION OF WATER-GAS PLANT.

In operating a water-gas plant for a number of years in a small gas-works, said Mr. C. F. Zeek, in the course of a paper read before the Southern Gas Association at Charleston (U.S.A.), he noticed from time to time marked improvement in manufacturing results over the daily average figures, without any apparent change in materials or manipulation of the plant. Sometimes the improvement was noticeable in only one direction, as, for instance, in generator fuel, or it might be in oil used per 1000 cubic feet, or, perhaps, in the quantity of gas made per hour. On other days all of these favourable factors might come together, with the result that unusual economy of materials per 1000 cubic feet was secured, as well as a cheapening of the labour item, by the increased output of the machine per hour. No doubt every superintendent in the land who had operated a single set, where the results on the one machine from day to day could be compared, had observed these apparent inconsistencies in his manufacturing results.

Taking note of the varying results on a plant for some months, and by a happy combination of watching and manipulation of the plant under favourable conditions, it was possible to discover some of the mysteries of past irregularities under what seemed to be identical conditions, so that they were able to increase the output per hour of the machine by over 100 per cent., with a large reduction per 1000 cubic feet in all materials used. The greatest single factor in improving the work was in the manipulation of the generator fire—in which almost the whole art of water-gas making lies in regulating the generator fire. This part of the plant was found far more sensitive than had been imagined—so much so, that it was not practicable to operate the set by hand to the best advantage.

It is not, the author continued, practicable, under ordinary conditions, to operate a water-gas set on a cycle shorter than six minutes; this cycle usually taking two minutes for blowing and four minutes for running. Better results can usually be obtained by shortening the cycle, the proper length of which must be determined for each kind of fuel. But such shortening of the cycle is impracticable by hand work, because of the physical strain on the gas maker. Having the plant already equipped with air-pressure service, it seemed as if this splendid servant might be made to do the gas-maker's part of the work, and with much more regularity. We set about developing this thought; and after much consideration and experimenting we evolved a simple, and comparatively inexpensive device that perfectly operates the set automatically.

In the first place, all valves except one are closed by gravity. This one exception is the hot valve; there being too much friction in its mechanism to permit of operating one way by gravity. So two cylinders were provided—one to open the valve, the other to close it. The reverse movement of the valves is accomplished by a cylinder and piston set under the valve-handle lever, operated by a water pressure under the piston, which holds the valve open the required length of time, when the pressure is released and the piston descends, closing the valve.

As air pressure is the motive power for operating the valves, and as the valves might stick to their seats when closed, an elastic medium like compressed air acting directly on the valve-lifting pistons would, no doubt, cause serious disaster to the valve and connections if the valve did stick and then suddenly let go. To overcome this danger, a hydraulic system is employed, consisting of a piece of 4-inch pipe from 12 to 48 inches long [as necessary to contain a sufficient quantity of water] in each air-line between the air control and the valve cylinder. The air entering the top of one of these water containers or cylinders forces the water out at the bottom and into the valve cylinder. Between the water container and the valve cylinder is interposed a swing check-valve set, to close against the flow of water toward the valve cylinder. A small hole drilled in this valve permits the water under pressure to slowly fill the valve cylinder, and this slowly opens the valve. The size of the orifice in the swing-check determines the speed of opening of the valve on the set; and with the air pressure released, the check-valve swings open, and the water quickly flows back from the valve cylinder to the water container, thus causing rapid closing of the valves on the set.

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[*] This interesting article reminds of the experiences related by Mr. Doig Gibb and others as referred to in the "JOURNAL" just about three years since—see Vol. CXIX., pp. 216, 337, 530, 714.—ED. J.G.L.

Air pressure to the water cylinders is controlled by specially designed balanced piston air-valves, operated by a series of cams on a shaft that makes one revolution per gas-making cycle. The adjustment of the cams, to obtain the desired sequence of the operation of the valves on the set, is accomplished by fingers on each end of the cam disc, which are adjustable and held at any desired point by a bolt-and-wing nut. The cam-shaft is rotated by clock mechanism and a pendulum, operated by a weight. A safety device is designed to prevent the racing of the cam-shaft in the event of breakage of any part of the clock-train or pendulum mechanism. Fingers on the safety device would be thrown outward by centrifugal force, and engage the shaft.

The design of the apparatus is such that if any accident happens to the air-pressure supply all valves would close, either when blowing or when a run was on, and the plant would come to rest in a safe condition. As all valves close when the air is cut off, and stay closed, disaster cannot happen from this cause. The apparatus has been in continuous operation since September, 1913; and, with the exception of minor troubles, mostly in the packings of the valve-cylinder pistons, it has been found exceedingly reliable and dependable. Objection has been made against the device because there is not a positive closing of the valves, and in some cases closing by gravity might be uncertain, and therefore dangerous. Experience has not shown any such danger, but rather that gravity is a very safe and dependable power; nor is there danger in practical working of foreign matter accumulating under a valve-disc that requires crushing in order to set the valve. However, a positive closing of the valve may be accomplished by superimposing a second cylinder and piston upon the one that opens the valve.

The author finds the best cycle for even the highest grade coke to be four minutes—consisting of about 90 seconds blow and 150 seconds run. Coaling-up is done every fifth run (or 20 minutes) and the fire is cleaned every fourth coaling—80 minutes.

CHEMICAL CONTROL OF PURIFIERS.

The following is an abstract translation of an article in the "Journal für Gasbeleuchtung" by Mr. C. J. H. Madsen, Chemist at the East Gas-Works, Copenhagen, on the importance of chemical control in the working of purifiers.

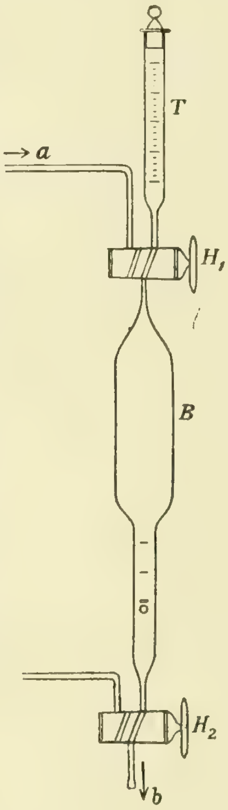
The author points out that the time for changing purifying material is generally determined by the use of moist lead paper, but that a more rational procedure is to be guided by determinations by gas analysis of the sulphuretted hydrogen at the outlet of the different purifiers. A rapid and convenient method of making such determinations he proceeds to describe. The advantage of this method of control is that there is less risk of the oxide being changed before it is actually necessary.

He uses as an illustration of his procedure the working in the No. 2 purifying-house at the East Gas-Works at Copenhagen, where four purifiers are worked in series, and daily about seven o'clock in the morning the order of working is changed—the vessel which was last in rotation being put first. The object of this method of working (which was introduced there in 1910) is to use up the oxide more completely. The vessels in turn take up sulphuretted hydrogen when in the first position, and then the oxide is revivified *in situ* when the vessel is in the last position. As a rule, the last two vessels are both "clean" to lead paper. With the method of working adopted the oxide is found to be spent after being changed twice or thrice, so that considerable economy is effected in wages for filling and emptying the vessels and turning the oxide during revivification. Sets of three vessels with a centre valve could be worked in the same manner; but in that case, as a rule, only one vessel would be "clean."

The author gives tables showing the proportion of sulphuretted hydrogen on different days at the inlet and outlet of each vessel in the series. The following figures taken from the table show the percentage of sulphuretted hydrogen on successive days with the same vessel and oxide as it changes its position from first to last in the series: First day, No. 1 position, inlet 1·64 per cent., outlet 0·21; second day, No. 2 position, inlet 0·12, outlet 0·06; third day, No. 3 position, inlet 0·05, outlet *nil;* fourth day, No. 4 position, inlet *nil*, outlet *nil*. The example quoted is for the least efficient charge of oxide in the four vessels at the time. The oxide in one of the other vessels when in the No. 1 position reduced the sulphuretted hydrogen to 0·07 per cent. The oxide for which the figures are given had been in use for ten weeks, and would be the first of the four to be changed. A month later this same vessel and oxide were doing less satisfactory work, the percentage of sulphuretted at the outlet when it was in the No. 1 position being 0·40. It still showed "clean" gas at the outlet when in the No. 3 position, but the opportunity was taken to change it after it had been in continuous use for 3 months 21 days. When removed it contained 30·4 per cent. of sulphur, reckoned on the dry material. It was very hard when taken out; and had it not been for this it might have continued in use considerably longer.

Other examples are given to illustrate how the analytical data of the proportion of sulphuretted hydrogen at the inlet and outlet of each vessel may be used to indicate how long a vessel may safely be retained in use without changing the oxide. When the oxide in the second vessel does not take up so much sulphuretted hydrogen that the third vessel can remove all that is left, the work is being carried on with one "clean" vessel, and it would appear then necessary to change the material in the second vessel.

The author next gives a table showing the number of times the oxide was changed during the years 1912 to 1914, when working with a daily change of rotation of the vessels, and during the years 1908-9, when the position of the vessels remained unaltered in the interval between two changes, the gas coming first in contact with the more foul, and secondly in contact with the less foul material. These figures show that vessels were changed in the eight months from April to November inclusive 79 times in 1908, 70 times in 1909, 44 times in 1912, 45 times in 1913, and 16 times in 1914—the make of gas not varying very greatly in this period in the different years. During 1912-13, the daily change of rotation with admission of air to the vessels was adopted, but analytical control of the working was not brought into use until 1914. The adoption of a system of analytical control reduced the number of changes of the oxide to 0·9 per 1000 million cubic feet of gas purified; whereas in 1912-13 the number averaged 2·7, and in 1908-9, under the old method, it averaged 4·5 per 1000 million cubic feet of gas. The economy of working under chemical control is evident from these figures. English coal only was carbonized, and the proportion of Prussian blue in the spent oxide, containing about 18 per cent. of moisture, varied from 8 to 10 per cent.



The illustration shows the form of burette which the author has used for sulphuretted hydrogen determinations. To fill the gas burette, the taps H_1 and H_2 are turned so that the gas flows in the direction from *a* to *b*. When the burette has been filled and the taps H_1 and H_2 closed, water is forced up by means of a levelling vessel through the tap H_2 to the zero mark—the surplus gas being expelled through *a*. With the tap H_1 shut, the water in the burette is sucked out to a level below the zero mark through the tap H_2. The reduced pressure in the burette allows of a few drops of starch solution being admitted through *b* and the tap H_2. With a slight vacuum in the burette, a standard solution of iodine is run in drop by drop from the titrating burette T, the whole burette being agitated between each drop. When a blue coloration persists, the quantity of iodine solution run in is read off. This completes the analysis.

The standard solution of iodine is prepared by dissolving 1·06 grammes of pure iodine in a litre of distilled water, adding 5 grammes of potassium iodide to promote the solution of the iodine. The solution must not be warmed. Of this standard iodine solution, 1 c.c. corresponds with 0·1 per cent. of sulphuretted hydrogen. As the titration burette is divided into tenths of a c.c., the proportion of sulphuretted hydrogen in the gas can be readily determined within 0·01 per cent. by volume.

The starch solution which is used as indicator is made by dissolving three grammes of pure soluble starch in 200 c.c. of water, with careful warming and stirring, but without boiling. The chemical reaction between the iodine and the sulphuretted hydrogen is shown by the equation $H_2S + I_2 = 2HI + S$. When there is no more sulphuretted hydrogen to saturate the free iodine admitted to the gas-burette, the excess of free iodine colours the starch solution blue.

FORMATION OF AMMONIA AND CYANOGEN DURING THE CARBONIZATION OF COAL.

The process of the formation of ammonia and cyanogen during the carbonization of coal is dealt with by Professor O. Simmersbach, in the report of the German Coke-Oven Committee.

The investigations have been made in a complete experimental laboratory plant. The heating of the carbonizing tube is by electricity, so that, by variation of resistance, the temperature may be exactly regulated. For the absorption of ammonia and cyanogen, the generally used dilute sulphuric acid and alkaline solution of ferrous sulphate are taken. The tar is condensed in a tube with cotton wool, and is afterwards washed out by chloroform. From the chloroform solution the ammonia is extracted, by shaking it with dilute sulphuric acid. Before starting the operation, air is removed from the plant by means of carbon dioxide; and at the end of the carbonization, the last particles of gas are driven out in a stream of pure nitrogen.

The estimation of ammonia, of course, gives no trouble at all. Cyanogen is estimated in the alkaline ferrous mixture by the Feld method [distillation with magnesium chloride and mercury bichloride, and titration of the distillate with deci-normal solution of silver]. More trouble is given by the estimation of nitrogen in the coke, as this is generally not readily accessible to chemical agents.

The common Kjeldahl method is of no use here; and therefore it has been modified in the following way. In a conical Jena flask of 750 ccm., 1·5 or 2 grammes of finely powdered coke are heated with 75 ccm. of strong sulphuric acid, on an asbestos-gauze in the full gas-flame. The mouth of the flask must be open, so that water vapours are allowed to escape. After half-an-hour's heating, 20 grammes of very thoroughly dried sulphate of potash are added. The heating is continued for two hours, and then 1 gramme of powdered chlorate of potash is added in small portions. When the action goes well, the process is finished when the boiling has been continued an hour after the addition of the chlorate. Of the sulphuric acid there is only one-half of the quantity left; the remainder has been decomposed or evaporated. After cooling, water is added, and then the flask is connected to a distilling apparatus. This done, caustic soda solution is added in small quantities through a tap-funnel. The ammonia is caught in a ten-bulb tube with a measured volume of deci-normal acid. In this way, the destruction of the coke is complete; and accurate figures are obtained.

From a great number of figures, the following results may be quoted.

Distribution of Nitrogen.

Silesian Coal with 6·63 *per Cent. Ash and* 1·396 *per Cent. Nitrogen.*

[In the tables, 1·396 nitrogen = 100.]

Carbonization Temp. Deg. C	Nitrogen in Ammonia. Per Cent.	Nitrogen in Cyanogen. Per Cent.	Nitrogen in Tar. Per Cent.	Free Nitrogen in Gas. Per Cent.	Nitrogen in Coke. Per Cent.
600	7·81	0·25	2·12	18·13	71·69
700	18·13	0·66	3·65	12·13	65·43
800	21·28	0·87	3·47	10·73	63 65
850	23·68	1·11	3·72	10·37	61·12
900	24·12	1·19	4·15	12·14	58·40
1000	23·15	1·23	4·11	21·53	49·98
1100	23·09	1 31	3·70	30·51	41·39
1200	22·84	1·42	4·21	45·10	26·43

Westphalian Coal with 5·7 *per Cent. Ash and* 1·391 *per Cent. Nitrogen.*

800	19·46	0·76	1·92	5·88	71·98
850	22·14	1·10	1·77	4·93	70·06
900	19·94	1·11	1·61	9·99	67·35
1000	19·61	1·25	1·87	21·54	55·73

The temperature for the maximum formation of ammonia seems to be at about 900° C. The amount of cyanogen rises with the temperature; and it appears that at 1200° C. the maximum is not attained. The Westphalian coal has a lower temperature for the maximum production of ammonia than the Silesian coal; the figure being 850° C. for the former, as against 900° C. for the latter.

The author gives also a tabulated summary showing the production of sulphate to be expected at different temperatures.

Silesian Coal (1·396 *per Cent. Nitrogen*).

Temperature. Deg. C.	Total Nitrogen in Coke.	Production of Sulphate Per Cent. of Dry Coal.
600	1·273	0·515
700	1·218	1·194
800	1 205	1·401
850	1 187	1·562
900	1·139	1·588
1000	0·997	1·525
1100	0·830	1·520
1200	0·529	1·504

Westphalian Coal (1·391 *per Cent. Nitrogen*).

800	1·275	1·277
850	1·243	1·453
900	1·204	1·309
1000	1·091	1·288

As a sequel to these experiments, there was investigated the possible destruction of ammonia when in contact with red-hot coke. For this purpose, perfectly dry ammonia gas was passed through a glazed porcelain tube filled with small coke. For measuring the temperature, there was in the centre of the coke layer a thermopile couple. The action in the tube leads, on the one hand, to the formation of hydrocyanic acid, and, on the other, to the destruction of ammonia into gaseous nitrogen and hydrogen. All are estimated in the usual manner.

Temperature of the Coke. Deg. C.	Duration of the Action between Coke and Ammonia. Seconds.	Quantity of Ammonia Remaining Intact. Per Cent.
700	0 66	76·16
700	1·68	56·95
700	3·44	37·75
700	3 75	62·48 (wet ammonia)
750	1·05	63·48
750	1·70	48·59

From the various experiments, the following conclusions are drawn, all of which have long been known.

1.—The formation of ammonia occurs chiefly at a temperature where the caking of the coal has been completed.

2.—The formation of ammonia has its maximum at different temperatures for different coals.

3.—This maximum temperature varies with the nature of the nitrogen compounds in the coal, and is between 800° and 900° C.

4.—The decomposition of ammonia in a concentrated gaseous state begins obviously at a temperature of 750° C., and is almost complete at about 800° C. But owing to its dilution with other gases, the destruction of ammonia in the carbonization of coal starts at about 900° C., and is increased with rising temperature.

5.—The formation of cyanogen increases with the quantity of ammonia and with the rise in temperature.

6.—The quantity of cyanogen formed in the destructive distillation of coal is about 1·2 per cent. of the total nitrogen in the coal, and about 5 per cent. of the total ammonia.

7.—Water vapour lowers the amount of cyanogen, but is favourable for the yield of ammonia.

8.—High speed of the flow of gas retards the decomposition of ammonia, and increases the formation of cyanogen.

9.—The dimensions of the pieces of coal have no influence on the formation of ammonia.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Institution of Gas Engineers "Roll of Honour."

Sir,—For insertion in the next volume of "Transactions" a list is being prepared of members of the Institution of Gas Engineers who are serving in His Majesty's Forces.

Will you allow me to ask the assistance of your readers in compiling this list; so that it may be made as complete as possible.

If they will send me the names of any honorary members, members, associate members, associates, or students they may know of who have joined the colours, with particulars of rank and the regiment in which they are serving, &c., the information will be much appreciated.

Walter T. Dunn, Secretary.

39, *Victoria Street, S.W.*,
July 28, 1915.

Production of Toluene.

Sir,—In your "Editorial" on p. 114 of the issue of the "Journal" for July 20, regarding "Market Value of Light Oils and Other Constituents of Tar," you ask for further information as to the extent to which the composition and stability of the gas are interfered with.

Might I suggest it would also be an opportune time, when almost all gas-works are putting in use the tar-washing process for the extraction of toluene, to inquire what effect (approximately) per gallon, pint, or gill of toluene extracted over and above the normal contents, will this process have on the volume of the gaseous products per ton of coal carbonized.

Normally, 1 ton of untreated tar contains 0 75 to 1 gallon of toluene, while by tar-washing treatment this can be increased to 3½ to 4 gallons. Assuming it takes 18 tons of coal to produce 1 ton of tar, then 1 ton of coal furnishes (say) 3 gills of toluene.

The chemical formula of toluene is C_7H_8; and if these gaseous compounds are transferred to the tar, what are the effects produced on the gaseous products in volume, calorific, and illuminating power?

T. W.

July 29, 1915.

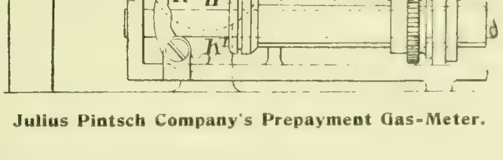
REGISTER OF PATENTS.

Prepayment Gas-Meters.

Julius Pintsch, of Vienna.

No. 3216; Feb. 6, 1914. Convention date, April 22, 1913.

This invention relates to a further development of the invention described in patent No. 2652 of 1914, and consists in a particular arrangement for actuating the slide which causes the gas cut-off member to close and open.



Julius Pintsch Company's Prepayment Gas-Meter.

According to the earlier patent, the slide, which by its movement at the end of the gas delivery period puts under tension a spring, is returned into its initial position by the spring on the insertion of a coin, whereby the gas-valve is opened. The employment of a spring is said to be open to the objection that, owing to the decrease of its tension occurring after some time, its effect varies and so impairs the uniform action of the apparatus. This inconvenience is, it is claimed, obviated by the present invention, which provides for a "perfectly positive and simple actuation of the slide."

The engraving shows an embodiment of the invention. The sleeve H is provided with a cylindrical head H¹ the bottom part of which is conical in shape. The arm K is constructed as a two-armed lever—the shorter arm K^1 being hook shaped. The arrangement is such that when the valve is open the head of the sleeve moving to the left may freely pass over the hook without turning the lever K K^1. At the end of the gas-delivery period, the head of the sleeve strikes against the long arm K of the lever and causes the gas-valve to be closed suddenly, by shifting the slide D; and the hooked arm of the lever is turned so as to abut against the conical part of the head of the sleeve. If, now, a coin is inserted, the sleeve moves again to the right, and its head turns the lever K K^1 as the hook slides along it. Thereby the slide is thus pushed to the right, and the valve opened.

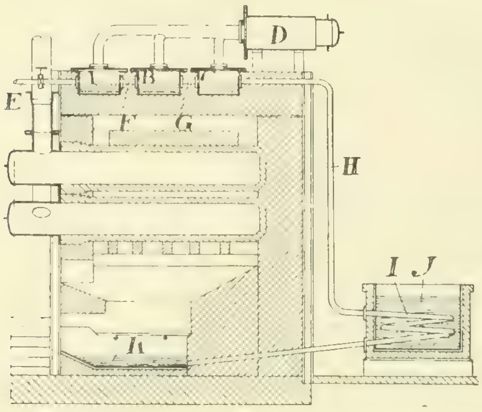
Treating Gas Liquor in Small Gas-Works.

Berlin-Anhaltische Maschinenbau-Actien-Gesellschaft, of Berlin.

No. 4243; Feb. 18, 1914. Convention date, Oct. 21, 1913.

This invention is a modification of the method of treating the gas liquor in small gas-works that was described in patent No. 4242 of 1914.

The "vigorous heating of the ammoniacal liquor, by means of which the ammonia contained in the ammoniacal liquor is completely driven off," is effected by arranging a plurality of evaporating vessels in series in the top course of the brickwork of the retort-furnaces. With this arrangement the cold, or slightly preliminarily heated, crude gas liquor flows to the first evaporating vessel in which it is warmed; while a portion of the volatile ammonia gases escapes. The warm ammoniacal liquor then enters a second evaporating vessel, which is also arranged in the top course of the retort-furnace, in which vessel it is vigorously heated, so that further quantities of the volatile ammonia contained in the liquor are driven off. The highly heated ammoniacal liquor then enters a third vessel; and, if necessary, additional vessels arranged in the top course of the furnaces are employed—heated to increasing temperatures "until finally the whole of the volatile ammonia contained in the ammoniacal liquor is eliminated."



A "Bamag" Liquor Apparatus for Small Works.

An installation for the treatment of the crude ammoniacal liquor in accordance with the invention is illustrated in section—with three evaporating vessels.

In the top course of the setting of the retorts evaporating vessels A B C are arranged—each closed by a cover. The volatile ammonia expelled from the crude liquor in the vessels by heating flows through conduits to the condenser D. The crude liquor, which may be preliminarily heated by flowing round the condenser (as indicated in the earlier specification referred to), flows through the conduit E into the evaporating vessel A. The ammoniacal liquor which has already been deprived of a portion of its ammonia vapours, issues from A and passes through the conduit F into the evaporating vessel B. Here it is further heated and yields up an additional proportion of its volatile constituents. It thence flows through the conduit G into the evaporating vessel C, in which "it is so highly heated that the whole of the volatile constituents are expelled." The water which flows out of the vessel C through the conduit H then passes through a coil I heating the acid bath J, and then enters the hearth K of the retort-furnace.

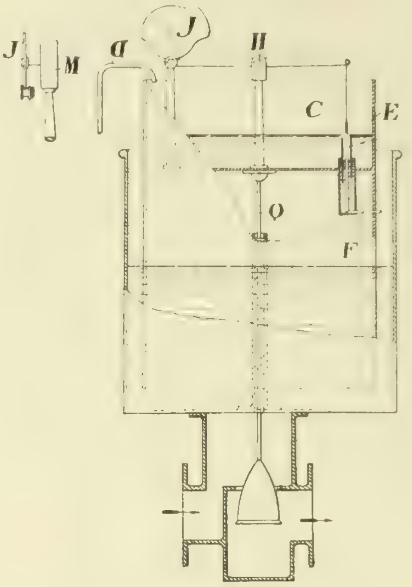
Gas-Governors.

Edwards, A. D., of Garston, near Liverpool.

No. 15,320; June 26, 1914.

This invention relates to gas-governors provided with means for automatically varying the load at certain times, so that the gas pressure may be kept substantially constant.

In the form illustrated, in order to utilize the principle of varying loading by varying the quantity of water entrapped from a constantly flowing stream, the governor bell is provided with an upper chamber C, to which water is constantly supplied by a pipe D, overflowing therefrom by pipes E F, which are relatively movable. The pipe E is carried from one end of a lever pivoted at H the other end carrying a roller in contact with the cam J, "which is shaped according to the polar curve of pressure with relation to time generally obtaining in the district to supply the pressure which it is desired to govern." The pipe F is surrounded for part of its length by the pipe E, which, in turn, is surrounded by K—mercury being supplied to form a seal between the pipes E and F. The disc J is rotated by clockwork M carried on a spindle. The division plate between the top and bottom parts of the governor bell also carries a rod Q passing through a sleeve and having mounted at the bottom end a valve S, controlling the passage in the gas outflow pipe.



Edwards' Gas-Governor.

In operation, as the disc J is rotated so the left end of the lever is raised or depressed, being kept in contact with the disc by the weight of the pipe E at the other end of the lever, and which end, together with the pipe E, is therefore correspondingly lowered or raised so that the liquid level in the tank C is lowered or raised, and so the loading on the governor bell is changed, and pressure automatically varied as desired.

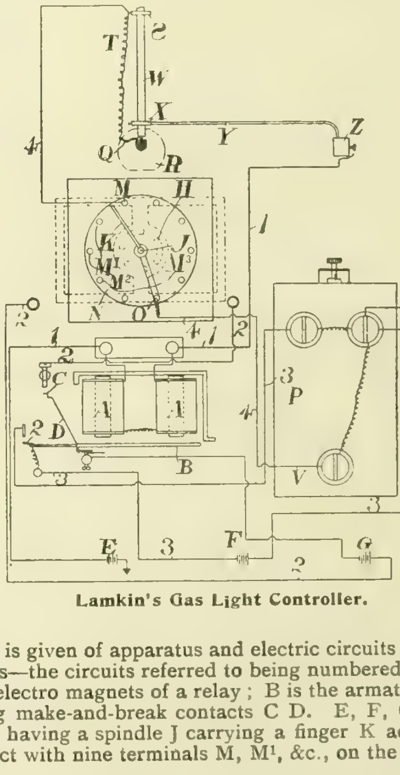
In cases where an intermittent change has to be made—such as the change for an extra cooking load on Sunday—a further cam disc is placed on the same shaft as the disc J, to only deal with the particular hours it is desired to vary; so that for the greater part of the day the disc J will itself be in operation, but for the remainder the added disc will act.

Controlling and Lighting Gas.

Lamkin, A. E., of Brighton.

No. 17,170; July 20, 1914.

Apparatus made in accordance with this invention comprises the combination of a terminal of a spark-gap mounted on the enclosing globe or chimney of each burner and two electric circuits closed by a relay, one of which closes the primary coil of an induction coil, while the other operates a motor adapted to close a series of wiping-contacts and place each of the circuits to the burners and spark-gaps in circuit with the secondary coil of an induction coil. Four electric circuits are consequently employed: (1) Adapted to be closed manually through a relay; (2) adapted to be closed by the relay circuit through a motor which is adapted to rotate an armature which carries a switch arm over wiping contacts; (3) the primary circuit of the induction coil; (4) a circuit through the secondary coil of the induction coil and through each of the circuits to the burners closed by the switch-arm rotated by the motor.



Lamkin's Gas Light Controller.

A diagram is given of apparatus and electric circuits of one form of the apparatus—the circuits referred to being numbered 1, 2, 3, 4.

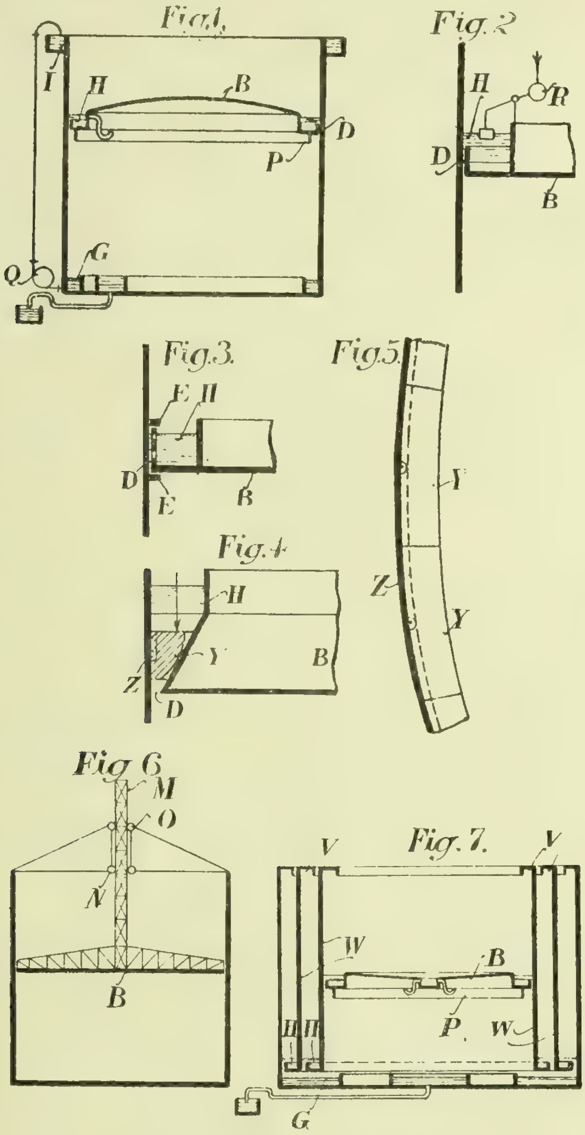
A are the electro magnets of a relay; B is the armature of the magnets carrying make-and-break contacts C D. E, F, G are batteries. H is a motor having a spindle J carrying a finger K adapted to make wiping-contact with nine terminals M, M^1, &c., on the dial N, each of which is connected to a separate burner. O is a terminal on the dial in the circuit 4, and electrically connected to the finger K. P is an induction coil. Q is one terminal of the spark gap mounted on the globe R, and connected to the terminal on the induction coil through the wire T supported by the insulated block S and through the conductor V, and back through the standard W to earth. X is a gas-cock connected by a pipe Y to the pneumatic plunger Z, by which it is adapted to be operated in any known manner. These valves are placed where separate control is required. An electrical switch is adapted to close the circuit 1 through the electro magnet A of the relay. This switch may be operated by the plunger in being moved to open the gas-valve, or the switch may be operated independently of the plunger.

Gasholders.

Maschinenfabrik Augsburg-Nürnberg, A. G., of Nuremberg, Germany.

No. 16,184; July 7, 1914. Convention date, Sept. 4, 1913.

This invention relates to a gasholder having a disc-shaped crown and a liquid seal, with the object of rendering it "possible to dispense with the double wall and the deep layer of liquid in the gasholder, and to employ nevertheless a liquid seal."



A Nuremberg Gasholder Patent.

Several ways of carrying the invention into effect are described and illustrated diagrammatically.

Fig. 1 is a sectional elevation of the principal form of the suggested holder, in which moves the disc-like closing member or crown B. Both holder and crown are sealed in relation to each other by the liquid seal H. The sealing liquid flowing down through the clearance space D between the closing member and the wall of the holder is collected in an annular channel G at the bottom of the holder, and forced back by a pump Q into the annular channel I at the upper edge of the holder, whence, by piping, it is conducted back to the sealing channel H. The reservoir G at the bottom of the holder receives the annular part P of the member B, when the latter is in its lowest position, and thus, if necessary, shuts off the inner gas space from the atmosphere.

The depth of the layer of liquid in the channel H is chosen according to the gas pressure obtaining. If it be intended to keep as small as possible the loss of liquid caused by the clearance D, then it is said to be best so to choose the height of the layer of liquid that the pressure at the bottom is only a little greater than the pressure of the gas, diminished by the adhesive action of the sealing liquid taking place in the clearance D. In order to regulate the quantity of liquid flowing at any time to the channel H and consequently to maintain the liquid in it at the correct level, a float can be arranged which, as shown in fig. 2, acts on a valve R in the supply pipe for the liquid.

In order to reduce the loss of liquid in the sealing device, one of a series of measures can be resorted to, as represented in figs. 3, 4, and 5. Fig. 3 shows the employment of packing strips, consisting of jute E. In figs. 4 and 5 an arrangement is shown in which separate sliding pieces Y, of wedge-shaped section, effect the sealing. The pieces are flexible, so that they automatically follow all deviations of shape occurring in the wall of the holder, and thus reduce to a minimum the clearance space D, even when in motion. In this connection, in order to ensure that there is always a film of liquid between the packing and wall, grooves Z are provided, which communicate with the sealing liquid by channels.

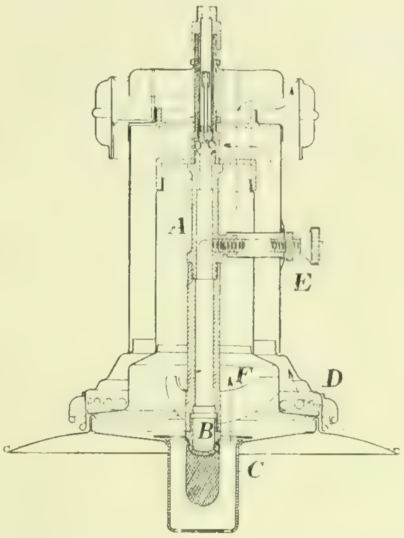
Figs. 6 and 7 show the general arrangement of holders "designed on the improved system." In order to ensure a more reliable guiding of the closing member B and at the same time slight play in the sealing, it is, in fig. 6, provided with a strong guiding pillar M consisting of ironwork, which rests against the guide rollers N O secured in the trusswork of the roof. Fig. 7 shows that the sealing system described can be employed also for telescopic gasholders. In such cases the design of the liquid seal with the reservoir can, without alteration, be applied to the telescopic jackets W. In the construction shown, all the movable members are formed with external cut flanges (to contain liquid) which engage with similar internal cup flanges V formed at the upper ends of the telescopic members and at the upper end of the external casing.

Compressed-Gas Lamps.

Ehrich and Graetz Company, of Berlin.

No. 16,132; July 6, 1914. Convention date, July 31, 1913.

This invention relates to a compressed-gas lamp for inverted incandescent gas lighting, in which the mixing air is heated before its admission into the mixing pipe, and a cylinder (preferably of quartz) closely surrounds the incandescent mantle.



A German Form of Compressed-Gas Lamp.

In the construction shown, the gas escaping from the nozzle into the mixing pipe A draws through openings above the desired quantity of air. The resulting mixture burns at B, which is connected to an incandescent mantle closely surrounded by the cylinder C, preferably of quartz. Fresh air is admitted through a series of openings D into the chamber E, rises upwards in the direction of the arrows, and passes through two pipes leading through the chimney to the air suction openings of the burner. A set-screw is used to regulate the proportion of air drawn in. The pipe A is provided at its lower end with ribs F resting against the lower portion of the inner wall of the chamber E. The heat radiated by the burner head or lower portion of the mixing pipe is, therefore, transmitted to the preliminary heating chamber, and the process already described takes place.

APPLICATIONS FOR LETTERS PATENT.

10,552.—Scott, W. G., "Shade holder." July 20.

10,621.—Tsuda, G., "Gas-meters." July 21.

10,724.—Baker, G. S., and Keith, J. & G., "Ovens for bread." July 23.

10,766.—Pease, E. L., "Burning of combustible fluid mixtures." July 24.

Gas Matters at Chelmsford.—At the monthly meeting of the Chelmsford Town Council last Wednesday, it was officially reported that the Chelmsford Corporation Gas Act, 1915, has now received the Royal Assent. It was also intimated that a new gasholder would shortly be required; and the Gas Committee recommended the Council to agree to the Gas Company accepting a tender by Messrs. C. & W. Walker, Limited, of Donnington, to erect a new gasholder, of a capacity of 400,000 cubic feet, for £10,100. The Committee further recommended that the costs be defrayed by means of a loan from Messrs. Barclay and Co., subject to the amount being repaid twelve months after the termination of the war or at any earlier date at the option of the Corporation. The Mayor stated that Messrs. Barclay were originally prepared to lend the money at 5 per cent. interest, but had since agreed to reduce the rate to 4½ per cent. The proposal was adopted.

PARLIAMENTARY INTELLIGENCE.

BILLS ROYAL ASSENTED.

The following Bills received the Royal Assent:

Ashington Urban District Council.
Barnoldswick Water.
Dewsbury Corporation.
Gas and Water Provisional Orders (No. 1).
Gas and Water Provisional Orders (No. 2).
Gas and Water Provisional Orders (No. 3).
Glasgow Corporation Orders Confirmation.
Lincoln Corporation.
Metropolitan Water Board.
Plymouth Corporation.
Port Glasgow Gas.
Price of Coal (Limitation).
Rhondda Urban District Council.
Southend Water.
South Staffordshire Water.
Weardale and Consett Water.
Wolverhampton Water.

Gas Undertakings Returns.

The Board of Trade returns relating to gas undertakings (local authorities and companies) were presented in the House of Commons on Monday last week and ordered to be printed.

Gas-Works and the Munitions Act.

Mr. W. Thorne, on Monday of last week, asked the Minister of Munitions whether gas-works, in consequence of manufacturing chemicals for high explosive shells, are, or may be, made subject to the Munitions of War Act; and whether any difference between gas-works' employees and the management would come within the scope of Part I. of the Act or be made the subject of proclamation.

Dr. Addison: Part I. of the Munitions of War Act can be applied by proclamation to any difference between employers and workmen which, in the opinion of His Majesty, is directly or indirectly prejudicial to the manufacture, transport, or supply of munitions of war. This is clearly wide enough to cover differences affecting the employees in question.

Mr. Thorne: Do gas-works, in consequence of making these chemicals, come under the Munitions of War Act?

Dr. Addison: At the present time they are not being declared controlled establishments.

German Factories in Holland.

Mr. Agg-Gardner, later on, asked the President of the Board of Trade whether the Act prohibiting trading with the enemy is being evaded by the establishment of German factories in Holland which—such as the Gautsch Incandescent Light Company, a branch of a German firm working with German capital, at Sloterdyk, near Amsterdam—flood the British market with their produce; and, if so, whether any steps will be taken to make the Act more effective.

Mr. Runciman: Goods (with certain minor exceptions) cannot be imported into this country from Holland unless accompanied by a certificate of origin issued by a British Consul. Such certificates are not granted in cases where the manufacturing firm is known to be a branch in Holland of an enemy firm. I shall be glad to consider any information respecting the particular firm referred to.

PRICE OF COAL (LIMITATION) BILL.

Bill Passes through Both Houses.

The Bill [*ante*, pp. 137, 197] to provide for the limitation of the price of coal at the pit head, presented by Mr. Runciman, passed through its remaining stages in the House of Commons last Tuesday. When the Bill as amended was brought up for consideration, the debate, for the most part, was in reference to household coal.

Sir Edwin Cornwall, in this connection, said he thought the leading coal merchants would be well advised if, after the debates in the House, and after public attention had been drawn to the matter, they undertook the responsibility of going to the various poor districts of London, and setting up in each of them some establishment under their own control where poor persons who had to buy small quantities of coal could do so without the cost of the trolley-men's wages and other items which belonged to the ordinary sales.

It was next agreed that sub-section 1 of clause 1 should be amended so as to read: "Coal at the pit's mouth shall not be sold or offered for sale directly or indirectly by the owner," &c.; it being pointed out that a sale indirectly to a second person would naturally lead to an evasion of the Act.

Similarly, sub-section 1 of clause 3 was amended so as to read: "If in any proceedings any question is raised as to the corresponding price of any coal, or as to the cost of railway or other incidental services, or as to the sums charged for the use or provision of trucks, the Court shall refer the question for determination by the Board of Trade."

Provision for Contracts.

Mr. Runciman, as promised, submitted the following provision with regard to contracts, which he moved should be added at the end of sub-section 2 of clause 3.

> "Provided that where any contract has been made on or after the first day of April, 1915, and before the commencement of this Act, for the sale of coal by the owner thereof at the pit's mouth, coal delivered under that contract after the expiration of the period fixed under this provision, and shown to be excepted coal within the meaning of this provision, shall, if the other party to the contract within two months after the commencement of this Act gives notice in writing to that effect to the owner of the coal at the pit's mouth, be deemed for the purposes of this Act to be sold at the time of the delivery thereof.
>
> "If in consequence of this provision the price to be paid by any person to whom coal is delivered is reduced by any amount, the price to be paid by any person to whom the coal is delivered in pursuance of any subsidiary contract shall be reduced by an equivalent amount. [Afterwards added: "and any purchaser under any such subsidiary contract shall have the same right to give notice to the owner of the coal at the pit's mouth as the person who has made the original contract with that owner, and any person who has sold the coal shall, if required, communicate to the purchaser the name of the person from whom the coal has been bought."]
>
> "For the purposes of this provision 'excepted coal' means coal supplied for domestic or household purposes to any person and coal supplied for any purpose to any local authority, or to any undertakers supplying gas, water, or electricity in any locality in pursuance of authority given by an Act of Parliament, or by an Order confirmed by, or having the effect of, an Act.
>
> "The period fixed under this provision shall be a period of three months after the commencement of this Act; but the owner of the coal at the pit's mouth may apply to the Board of Trade for an extension of that period, and the Board of Trade may, if they are satisfied that there are special reasons in the case in question for such an extension, extend the period for such time as they think just under the circumstances, and the period as so extended shall in such a case be the period fixed under this provision."

Of various amendments proposed, all were negatived, save the one (which was accepted) for the insertion of the words shown in brackets at the end of the second paragraph.

The Bill was then read the third time and passed.

In the House of Lords, on the following (Wednesday) night, it passed through all stages.

LEGAL INTELLIGENCE.

CHARGES AGAINST FORMER GAS OFFICIALS.

Accounts of the Walton-on-Thames and Weybridge Gas Company.

Acquittal of the Secretary.

CENTRAL CRIMINAL COURT.—Monday, July 26.

(*Before the* Recorder of London *and a* Jury.)

Thomas Henry Lamb, late Secretary of the Walton-on-Thames and Weybridge Gas Company, was on trial on a charge of feloniously stealing certain sums of money—£100 8s. 8d., £17 10s., and £99 7s. 4d.—belonging to the Company. George Waters Ross, late Chief Clerk and Collector of the Company, who was charged with him, had pleaded "Guilty." The first portion of the proceedings was reported in last week's issue of the "Journal" [pp. 200-2].

Mr. W. H. Moresby (instructed by Mr. W. L. J. Crosby) prosecuted. Mr. Ernest E. Wild, K.C., and Mr. A. S. Comyns Carr defended Lamb; and Mr. David White appeared for Ross. The Solicitors for the defence were Messrs. White and Co.

George Waters Ross, on following Lamb in the witness-box to give evidence for the defence, was examined by Mr. Comyns Carr, and stated that he had the handling of all cash out and in. He was sixteen years old when he joined the Company about 23 years ago. As far as he knew, from beginning to end, the defendant Lamb had no knowledge of these frauds, which had been going on for twelve years. He remembered having a conversation with Lamb towards the end of 1913. Lamb then asked witness if he could borrow some money for him on the security of an endowment policy. Lamb said he wanted £100. Witness promised to see what he could do, and next day told him his wife had come into some money, and he could arrange to let him have what he wanted. As a matter of fact, she had not come into any money. Every penny of what he gave Lamb was the money of the Company; but Lamb was not told this until Sept. 23. Witness asked Mr. Price if he could have a fortnight to find the money, when the defalcation was discovered. At first, he told the Directors, when asked for an explanation, that Lamb had had the money.

Cross-examined: Lamb had free access to all the books in the office. He was never in fear of Lamb finding out what was going on; for he never paid any attention to the books. All he asked was how the money was coming in. He was not surprised that Lamb, whom he always treated as a superior, should come to him and ask if he knew how he could raise some money. It was true to say he stole the money, and helped Lamb.

The Recorder: You say Lamb knew nothing about this matter, and yet on Sept. 24 he had been summarily dismissed. Why did you not at once say to the Directors, "This man has done nothing at all?"

Witness: I was trying to hide everything then.

Cross-examination continued: He had now a strong feeling against Price. The reason he told the Directors at first that he had "faked" the books and Lamb had had the money, was because he thought the Board might not prosecute Lamb while they would him (witness).

Re-examined: The Auditors even could not have discovered the frauds, unless they got to the root of the whole thing—and this was the receipt counterfoils. He even had a private receipt-book which he carried in his pocket.

Tuesday, July 27.

Rev. *Walter K. Bussell*, Vicar of Walton Parish Church, was the first witness called to-day. He stated that he had known prisoner well for fourteen years, and had always had the very highest opinion of him. So far as he knew, this was the general character enjoyed by Lamb in Walton. Ross had been known to him for twelve years, and also held a high character in the neighbourhood.

The Recorder remarked that he did not know what use evidence of character would be in the case of Ross, when he had admitted that for the past twelve years he had been systematically defrauding his employers, and falsifying the books so that these frauds should not be discovered. Ross was the most unsatisfactory witness he had heard in that Court during the past fourteen years.

Mrs. *Alice M. Lamb*, wife of the prisoner, was then called, and said that during the last few years she had had to undergo several expensive and serious operations. On Sept. 24, she overheard what took place in the Board-room at the full Directors' meeting; and she repeated the details of the conversation. The question of a prosecution was discussed before Lamb and Ross were called into the room. Her husband all along denied that he knew any more of the matter than he had stated. Later, she heard someone in the room say, "Do you think the boy had any of the money." The reply was, "Well, if he has not had any of the money, he must have known all about it; but it is no use bothering about him, as he is not guaranteed." The question of a prosecution was then referred to, and the Guarantee Society were mentioned—it being decided to leave the matter with them. Some of the Directors, including the Chairman, seemed unwilling to prosecute. She recounted the subsequent interview with Mr. Sherwell at the Guarantee Society's office. Mr. Sherwell told her that the Directors of the Gas Company had just been, and had left the matter in his hands to settle. She said the £500 would be paid on condition that there was no prosecution either by the Society or the Gas Company. Mr. Sherwell replied: "You can rest assured that if you pay this £500 there will be no prosecution." On this representation, she parted with her policy. When the money and policy were handed over, Mr. Sherwell again assured her that he had the full authority of the Gas Company to settle the matter. Her husband asked for a statement in writing to this effect; but Mr. Sherwell replied that it would not be worth the paper it was written upon, and they could take his word that the matter had been left in his hands entirely. To pay this money, she had ruined herself.

Cross-examined: She wrote down the conversations heard by her; but what she wrote was not now in existence, and she did not remember when she wrote it. Apart from the notes, she would never forget the conversations. She did not suggest that either she or her husband had communicated with the Gas Company on the question of whether there would be a prosecution.

Re-examined: She knew her husband deserved to be dismissed, apart from all questions of dishonesty, because he had neglected his work.

This concluded the case for the defence.

Mr. *F. H. Sherwell*, Manager and Secretary of the Guarantee Society, Limited, who appeared on the prosecution's *subpœna*, examined by Mr. Moresby, produced the fidelity policy taken out by the Gas Company. It was dated May 4, 1892, and insured Lamb in a sum not exceeding £1000 in respect of "fraud or dishonesty." There was a clause, which was now really obsolete, under which, on proceedings being taken by the employer against the insured person, the Society were enabled to carry on a prosecution at their own expense. On Sept. 24, Mr. Bilney wrote to the Society informing them of the defalcations, and claiming the amounts under Lamb's and Ross's policies. In reply, witness sent on to the Gas Company forms of claim to be filled in. On Oct. 1 he wrote to Mr. Bilney asking for the policy belonging to Lamb to be forwarded. He was not sure when he first got knowledge that there was such a policy in existence; but he had requested Lamb to call, and he had done so. The Society at once made a demand upon him to be indemnified. Lamb expressed a desire to meet this demand, and made a statement of his assets. On Oct. 15 he wrote Mr. Bilney: "It is due from me to inform you that the Society have, in consideration of certain payments and the assignment of certain policies, given Lamb a settlement in full discharge."

Mr. Moresby: Is that the first intimation to the Gas Company of what had taken place?

Witness: Yes. I had no authority from the Gas Company to settle.

The Recorder: Whatever you did, you acted solely on behalf of the Society you represent?

Witness: I submit that the defendants were not only defaulters, but they were debtors.

Mr. Moresby: It has been suggested throughout this case that you were acting as agents for the Gas Company in this settlement?

Witness: I had no such authority.

Did you ever state to Lamb or his wife that you had such authority?—Never.

Further examined: When the receipt for the policies and money was given, he was asked to associate the Gas Company with the discharge; and he said he could not do so. On Nov. 23, Mr. Bilney wrote saying Ross had stated at the Police Court that Lamb had paid £500, and he (Ross) had also paid certain sums. Witness replied the following day that the £500 had been accepted by the Society from Lamb in full settlement and discharge of the Society's claim. Many further letters had passed, which were all put in. Mr. Bilney, witness said, was the only Director of the Gas Company he had ever seen. He understood Mr. Bilney to say the Directors had no intention of prosecuting, and was surprised to learn they were doing so. Possibly he told Mr. and Mrs. Lamb he believed the Company were not prosecuting.

The Recorder: The suggestion is—and it was contained in a registered letter by Mrs. Lamb to you, which you did not answer—that you stated that there would be no prosecution, and that was why the £500 was paid?

Witness: Not at all.

Mr. Moresby: Why did you not answer the letter?

Witness: I should not answer a letter like that. I should pass it on to our Solicitors.

Was there at any time any bargain between your Society and the Gas Company by which there was to be no prosecution if the money was paid to you by Lamb?—None whatever.

At any time?—None whatever.

Cross examined by Mr. Wild, witness said he could not repeat Mr. Bilney's exact words; but he had no doubt the sense of the words was to lead him to believe the Company were not going to prosecute, and this was no doubt what he led the Lambs to believe.

Mr. Wild: Have you any kind of doubt that, if they had not had a moral undertaking that there would be no prosecution, they would have sold themselves up to find the money, in the way they did?

Witness: I think they would still have done so. I have yet to learn that it is not in the interest of a defendant not to make restitution, even if he is to be prosecuted.

When you received this money, were you not under the belief that no prosecution would take place?—That is so; but it was not a condition to my receiving the money.

Further cross-examined: Under the policy it was true that the Society could force the Company to arrest, and to give evidence, and to take proceedings in any name or names they liked. In other words, the Society had a right to prosecute in the name of the Gas Company—indemnifying them against all charges.

Mr. Wild: I suggest that Mr. Bilney told you of the existence of the endowment policy. Will you swear he did not?

Witness: I cannot swear. He might have done so; but I fancy it may have been the defendant.

Will you tell the Jury what you say passed between you and Mrs. Lamb when she called on you?—I have no recollection.

I suggest you told her you had seen the Company's Directors—or, at all events, a Director?—I cannot swear that I did or did not.

Did you say they had left it entirely in your hands to settle?—Certainly not. I should never have made a remark like that.

Did you tell her if the £500 was paid, they would hear nothing more about the matter?—Certainly not. We had our rights which we should have exercised if they had not satisfied us.

What were your rights?—Civil rights.

The Recorder: Did you say, "You may rest assured if you pay the £500 there will be no prosecution?"

Witness: No, my Lord.

Did you tell her, as she says: "All I have to do is to ring-up Mr. Bilney, and he is prepared to issue a warrant at any moment, if the Society cannot get the money we want. I am between two fires—my Directors and the Walton Directors. My Directors meet to-morrow?"—Certainly not.

Mr. Wild: Do you remember a single thing you or she said?

Witness: No.

The Recorder: Did you not know that, under the terms of your policy, you could call on the Gas Company to institute a prosecution?

Witness: It did not occur to me.

Mr. Wild: Would you have paid if it had been a civil matter?

Witness: If it had been a case of fraud or dishonesty, we should have paid, whether there was a prosecution or not.

The Recorder: The suggestion is you pressed Mr. and Mrs. Lamb to give £500, on the understanding there would be no prosecution?

Witness: It is untrue, my Lord.

Mr. Wild: In a letter to you, Mrs. Lamb said she had paid the £500 only on condition that no proceedings, criminal or otherwise, were taken against her husband?

Witness: I did not tell her so.

Has she told the truth or not? If not, why did you not write and say so? Why did you not answer that letter? It was a registered letter.—I declined to answer the letter—a most improper letter.

The Recorder: Did you tell her when you saw her on the following day why you had not acknowledged the letter?—I do not think it was mentioned.

Mr. Wild: I suggest that you were bringing pressure—criminal pressure—against these people, guilty or innocent.

Witness was then severely pressed by Mr. Wild as to whether he had told the Lambs that Mr. Bilney had said there would be no prosecution; and finally he replied that it might be taken he did do so.

The Recorder: Are you quite sure you did not say what I just now referred to, about ringing-up Mr. Bilney to get a warrant?

Witness replied that he was.

A Verdict of "Not Guilty."

The Recorder: Well, I do not know, I am sure, what the Jury say about this case. I do not know what they meant by the communication they handed me earlier in the day. Gentlemen of the Jury, you have now heard the whole of the evidence, both for the prosecution and the defence; and you have heard also what the last witness had to say. The charge is that the prisoner, being a servant of the Gas Company, feloniously stole the sums of money mentioned in the indictment. It is abundantly clear that these sums were, in fact, stolen; and it is also abundantly proved, if you believe the evidence, that there was extensive falsification of the books of the Company. It has, indeed, been admitted by Ross that he did steal the money and falsify the books. The plea of Ross would not be evidence against the prisoner. The case for the prosecution was that Lamb was acting with Ross, and was conscious of all that was done, and that he, in conjunction with Ross, stole these moneys. The prosecution have to make that out, without reasonable doubt. If you have come to the conclusion—if that is the meaning of the communication you have made—that there is a reasonable doubt as to whether the prosecution have made out that, you may say so. If, on the other hand, you are not of that opinion, we must proceed further with the matter, and finish the case.

After the Jury had consulted for a minute or two in the box, the Foreman announced that they were agreed upon their verdict, which was one of "Not guilty."

Mr. Moresby: I do not propose to proceed with the other charges.

Formal verdicts of "Not guilty" were then recorded in the other indictment for felony and the misdemeanour indictment for conspiracy.

Sentence upon Ross.

Captain *C. W. Holmes*, Mr. *H. Pullman* (a Director of the Gas Company), and Police Superintendent *W. Marshall* having been called to speak as to the character of Ross, who had pleaded "Guilty" to the two indictments for felony,

Mr. Comyns Carr addressed the Court on behalf of the prisoner. He pointed out that while, up to a certain stage, Ross was willing to help himself by trying to shift blame on to the shoulders of the other defendant, the moment the matter became one of prosecution, he took up another attitude altogether. He took the whole blame—and truthfully—upon himself; and it showed that there must be something that was not altogether wrong in the man's character that he should frankly and fully take upon himself responsibility such as this. The Guarantee Society had admitted having had £500 from Lamb; and they had also demanded £150 from Ross. If this man had paid the whole of the £150, he would no doubt have received a similar assurance to that given to Lamb. He did, in fact, pay £115, and so made what restitution he was able.

Ross, on being asked if he had anything to say, remarked that twelve years ago he received from the Company £145 a year, and certain emoluments for overtime amounting to £27. The latter were afterwards cancelled, and replaced by an addition of £15 per annum to his pay. After eighteen years' service, he got a rise of £5 a year.

The Recorder: You have pleaded guilty to these very serious offences; and by your own admissions in the witness-box, you not only misappropriated large sums the property of your employers, but, in order to hide-up your defalcations, you systematically falsified your books, week after week, month after month, and year after year, for twelve years. In the end, as always happens in these cases, the matter was discovered, in connection with the Clayton cheque, and then, after statements you made, both you and Lamb were summarily dismissed. Lamb was personally responsible for the books, and no doubt was liable to be dismissed in consequence of not looking after you; but by your actions, you led everybody to think you were acting with Lamb in what you did. The effect of this has been that Lamb has been prosecuted, and has had to stand his trial for the offence. What distressed me with reference to your evidence was that you displayed such disregard for the truth. You have admitted, I understand, misappropriating between £700 and £800. Larceny by a servant is always a most serious offence, and it is greatly aggravated when it extends over so long a period of time, and is so skilfully carried out as to deceive even the Auditors. I should be lacking in my duty if I passed on you a less sentence than twelve months' imprisonment with hard labour.

RIVER POLLUTION BY GAS-WORKS.

A Case at Retford.

The Retford Corporation were summoned last week before the Borough Magistrates for causing gas tar and ammoniacal liquor to flow into the Moorgate Beck, which runs into the River Idle, a tributary of the Trent, to such an extent as to kill fish.

Mr. H. Maddocks appeared for the Trent Fishery Board; Mr. T. E. Ellison represented the Corporation.

Mr. Maddocks, in opening the case, metioned that the prosecution was taken under the Salmon Fisheries Act, 1861; the maximum penalty being one of £5. The summons related to an offence committed on May 5. The defendants were the owners of the gas-works at Retford; and under the works for a distance of about 50 yards there was a culvert which had its outlet in the Moorgate Beck. The beck flowed into the Idle at a distance of 500 or 600 yards further down. In the afternoon of May 5, a man named Wood and his brother, who were weed-cutters in the employ of the River Idle Fishing Club, were engaged about 1¾ miles below Retford; and they noticed that the fish were greatly agitated. They were darting about here and there as though they were "mad." They also noticed that the water was of a yellowish colour, and smelt very strongly of tar and ammonia. On the following day they saw thousands of dead fish on the bed of the stream. The bed was inspected on May 8, and traces of tar and a yellowish deposit on the bottom and sides for a distance of 500 to 600 yards were found. Not a single live fish was seen below Moorgate Beck for 1¾ miles; while in the reach above the gas-works the fish were apparently all right. On May 15 a visit was paid to the gas-works, and a well was inspected. The contents of the well did not rise; and it was apparent that there was great leakage from the well, which communicated direct with the Moorgate Beck. Therefore, the whole matter was explained. Dead fish were found four miles below the gas-works. All the money that had been spent and all the sport that could be enjoyed had been absolutely swept away by reason of the neglect on the part of the persons having control of the gas-works. He understood that some kind of shadowy excuse was to be put forward—namely, that the Government required the residuals that remained after making gas to be kept for war purposes. How this could affect in any way the turning of the poisonous matter into the stream he was totally at a loss to understand. To put it on the ground of patriotism, was to make patriotism absurd.

Evidence having been given as to the dead fish and the smell of ammonia in the water,

Professor *Percy Frankland*, of Birmingham University, said he had analyzed two samples of the water from the beck, one taken 50 yards and the other 250 yards below the gas-works. The samples were highly polluted liquids containing oily matter and a considerable amount of ammonia, showing that the pollution was caused by gas-works products. He experimented with goldfish. The one he placed in the first sample died in three hours, and the one placed in the other sample died within twenty-four hours.

Professor *R. F. F. Leith*, also of Birmingham University, spoke to examining the samples of water, which disclosed pollution of an extreme character. The gravest ingredients were products from a gas-works. In fact, they could come from no other source.

Mr. Ellison, for the defence, commented on the fact that no direct evidence had been given as to what had caused the fish to die, or as to the state of the water on May 5; while the samples of the water that had been analyzed were not taken in the presence of anyone connected with the gas-works, nor were they fair samples of the state of the flow of the river on that date. Matters were perfectly satisfactory until the war broke out, when the conditions very materially changed. The Corporation were circularized (as he believed every authority in the kingdom was) by a Government Department, to the effect that crude tar was not to be used on the roads, nor was it to be disposed of to other than tar distillers, who utilized certain of its properties on behalf of the Government. The requirements of the War Office were considered by the Corporation to be even more important at this time than the preservation of fish in the River Idle. If it were true that the liquor got into the beck, it escaped out of the tank without their knowledge or having the means to prevent it. When these conditions arose, the Corporation at once started to build a new tank on up-to-date lines of double the capacity of the old one, in order that during the war they should be able to store more than double the usual quantity of tar and ammoniacal liquor. While the work was in progress, the liquid collected in the old tank to such an extent that it rose above the ordinary level, and to some degree it escaped. In these special circumstances, Counsel submitted that there was nothing the Corporation could do reasonably to avoid it. There was no wilfulness about the matter at all. They were in an extremely difficult position, owing to the war, for it entirely altered the normal state of things. The question arose whether it could be said that the Corporation caused "the liquid to flow into the beck." The new tank was completed on July 3; and since then there had been no reason for complaint.

Mr. *J. B. Fenwick*, the Manager of the gas-works, bore out the statement as to the difficulty experienced with regard to the disposal of crude tar and ammoniacal liquor. At the beginning of March, he said, he told the Committee something must be done to increase the storage. The work of constructing a new tank of double the capacity of the existing one was immediately begun, and the tank was brought into use on July 3—the old tank being emptied. The gas tar and ammoniacal liquor might have flowed into the beck. It was impossible to see it get into the beck.

After an absence of nearly half-an-hour, the Chairman announced that the Magistrates had decided to convict. The Corporation were fined £5, and ordered to pay £25 towards the costs of the prosecution.

AFFAIRS OF THE TICEHURST AND DISTRICT WATER AND GAS COMPANY.

On Tuesday last, the further consideration of a debenture holders' action relating to the above-named Company came before Mr. Justice Eve in the Chancery Division of the High Court.

Mr. Marten explained that the undertaking had been sold with the approval of the Court, and the sanction of an Act of Parliament; and the object of the present action was to distribute the proceeds. The money realized by the sale (£9557) had been brought into Court; but it was not sufficient to pay the principal due on the debentures—£10,400 and £2000 for arrears of interest. A Receiver had been appointed of the net earnings of the concern; but there were none, and at the date of the appointment £6000 was due to trade creditors. The Receiver had managed the property with great skill; and his efforts had been most successful. When the Receiver was appointed, it was found that two statutory districts had been assigned by the Directors to another Company which they had promoted—the result being that the Company were under obligation to supply water at 6d. per 1000 gallons, whereas it cost them 9½d. Actions were brought by the Receiver in order to get rid of these agreements; and they had been successful. It was now asked that the costs incurred should be included in the charges payable to the Receiver. The remuneration payable to him had been fixed by the Master at £600.

His Lordship ordered the costs of the plaintiff, and of the Receiver, to be taxed as between solicitor and client and paid out of the assets—including the costs of realization and the costs of the two actions.

As interest on the debentures was payable in priority to capital, it was arranged that the interest should be levelled-up to February, 1912, the date when the last payment was made, and that the balance should then be divided rateably.

UNSUCCESSFUL WORKMAN'S COMPENSATION CLAIM.

Action against the Wandsworth Gas Company.

At the Wandsworth County Court, on Monday of last week, before Judge Harington and the Medical Assessor, an application was made by Phillip C. Paulizki against the Wandsworth, Wimbledon, and Epsom Gas Company, under the Workmen's Compensation Act, to review and increase a weekly payment ordered to be made on a former occasion.

Mr. Hanne appeared for the applicant; Mr. Shakespeare (instructed by Messrs. Sloper, Potter, and Gosden) represented the Gas Company.

Mr. Hanne stated that the claim was originally before the Judge in April, 1913. It appeared from the evidence that the applicant was employed by the Company, and was struck by an iron bar, and knocked down senseless. There was, he believed, some concussion; and the man was removed to the Bolingbroke Hospital. For the time being, the Company paid him compensation at the rate of 16s. a week. When the case came before the Judge, medical evidence was taken, and a nominal award was made of 1d. a week, which had been continued up to now. Some months after the award was made, there seemed to be something peculiar about applicant's manner; and eventually he was put under restraint, in Long Grove Asylum, where he was certified as suffering from delusions. Two months ago, he was discharged from the asylum and returned to Wandsworth; and immediately afterwards proceedings were taken to revive the matter with a view to increasing the amount of compensation. Applicant had never before suffered from delusions, there was no such thing as insanity in the family, and there seemed to be no reason why he should have become insane, excepting as a result of the blow on the head. The accident, further, seemed to have dislocated some of the muscles at the back of the neck. He hoped his Honour would come to the conclusion that the man was not a "slacker," and that his present incapacity was really due to the effects of the accident of December, 1912. If the man had concussion in December, 1912, and in April, 1913, was certified as being able to work, it was possible within the next eighteen months that some complications might arise out of the concussion.

Applicant, giving evidence, stated that he was working at the furnaces when he met with the accident. Another man had a long bar of iron; and he missed the catch of the furnace-door, and the bar of iron came down and hit him (applicant) across the head. He was now always in pain on the left side of his head.

Dr. *M'Dowell* said he had examined applicant, and found that concussion might have been the result as he stated. Concussion frequently caused other things to develop. Asked whether applicant was in a condition to carry out his work as a gas-stoker, witness said he could actually do the physical work; but the man was just over the border line, and to subject him to work such as he would have to do in the gas-works, or any labouring work he would have to assist in, would be to throw him off his balance altogether. He (witness) found nothing the matter with applicant except his mental condition and the back of his neck.

Dr. *Morris Craig*, for the respondents, said he had examined applicant, and from his condition he did not think the blow he received was a severe one. Further, the history of the case, and his own observation, led him to the opinion that there was no connection at all between applicant's present condition of mind and the blow on the head.

Evidence having also been given by Dr. *Ogilvie*, of Long Grove Asylum, Epsom,

His HONOUR said the matter was a medical one; and so far as applicant's physical condition was concerned, there was no question as to his recovery from the effects of the blow. The only point was as to his present mental condition, and whether there was any connection between this and the accident he met with. He could only express the opinion the Medical Assessor had formed after the evidence—that there was nothing pathological to connect the applicant's mental condition with the blow. The case must therefore go to the respondents.

MISCELLANEOUS NEWS.

BRENTFORD GAS COMPANY.

Half-Yearly Report and Accounts.

In their report for the six months ended June 30 (which is to be presented at the half-yearly meeting on Friday) the Directors state that the accounts show a profit on the revenue account for the half year of £67,402. After providing for fixed charges, conveyance duty, compensation, &c., paid under the Brentford Gas Act, 1914, there remains the sum of £39,479, which, with the balance brought forward from last account, makes an amount of £116,487 available for dividends. The Directors recommend the declaration of dividends, subject to income-tax, at the rate of 5 per cent. per annum on the preference stock, £5 12s. per cent. per annum on the "A" consolidated stock, and 5½ per cent. per annum on the "B" consolidated stock. The accounts include, for the first time, the figures of the Staines and Egham and Sunbury Gas Companies; and the Directors are pleased to report that both the Companies taken over show satisfactory results. The increase in gas sold is 1·65 per cent. as compared with the corresponding half year. The total number of consumers is 116,207. The number of the Company's employees who have joined the army up to the present time is over 400. The Company issued an appeal for further capital; and the response was very satisfactory.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £226,714; from the rental of meters, stoves, and fittings, to £40,604; and from the sale of residual products, to £52,584—the total receipts being £319,952. The expenditure on manufacture of gas was £170,116; on distribution, £41,031; and on management, £9948—the total expenditure being £252,549. The balance carried to the profit and loss account is £67,402.

There were 97,169 tons of coal and 1,957,138 gallons of oil used during the half year in the production of 2,033,502,000 cubic feet of gas (including 857,468,000 cubic feet of carburetted water gas), of which 1,917,669,000 cubic feet were sold and 1,949,082,000 cubic feet were accounted for.

MUNICH CORPORATION GAS-WORKS.

The Last-Issued Report.

The report of the Munich Corporation Gas-Works for the financial year 1913 was published in the "Journal für Gasbeleuchtung" of the 3rd ult.; and from it the following particulars are taken.

The gas consumption during the year amounted to 44,961,960 cubic metres [1588 million cubic feet], which is 6·31 per cent. higher than in the previous year. The consumption was distributed as follows: For public lighting, 8·67 per cent.; for gas-engines, 0·65 per cent.; for cooking and heating, 58·25 per cent.; for lighting, 22·39 per cent.; through prepayment meters, 6·29 per cent.; works consumption, 1·30 per cent.; unaccounted-for, 2·45 per cent. The number of gas consumers increased by 6742—giving at the end of the year a total of 87,411.

Of the gas made, the Dachauer Strasse works produced 62·03 per cent.; the Kirchstein works, the rest. Only coal gas was made at the Dachauer Strasse works; but 3·78 per cent. of the gas produced at the Kirchstein works was water gas. At the time of maximum output there were eighteen settings with a total of 54 carbonizing ovens in action at the Dachauer Strasse works. The coke used as fuel in the producers at these works amounted to 14·62 per cent. by weight of the coal carbonized. At the Kirchstein works there were in use at the time of maximum output five settings with a total of fifteen carbonizing ovens and thirty-five retort-settings with a total of 305 retorts. The consumption of coke in heating the ovens and retorts at these works amounted to 14·08 per cent. by weight of the coal carbonized.

The coal carbonized came chiefly from the Saar district; the remainder being from Austrian Silesia and Upper Silesia. At the Kirchstein works water gas was produced partly by the admission of steam into the incandescent bed of coke in the carbonizing chambers, and partly in special water-gas plant. In the latter plant, blue or uncarburetted water gas was made at times and carburetted water gas at other times. The consumption of coke in the manufacture of the blue water gas averaged 52·7 lbs. per 1000 cubic feet; and there were consumed in the manufacture of 1000 cubic feet of carburetted water gas 50·3 lbs. of coke and 2 gallons of oil. The comparatively high consumption of coke was due to irregular use of the water-gas plant.

At the Kirchstein works 0·44 metric ton of benzol and 7·878 metric tons of xylol were used in the year for the prevention of naphthalene stoppages. The yield of tar amounted at the Dachauer Strasse works to 111·3 lbs., and at the Kirchstein works to 126·3 lbs. per ton of coal carbonized. The yield of ammonia per ton of coal carbonized was 4·75 lbs. at the Dachauer Strasse works, and 4·6 lbs. at the Kirchstein works. The gas supplied had an average calorific power of 568 B.Th.U. gross and 506 B.Th.U. net per cubic foot, at 60° Fahr., 30 inches, and saturated. Its specific gravity averaged ·488. The spent oxide sold contained on the average 10·21 per cent. of Prussian blue.

BLACKBURN CORPORATION GAS-WORKS.

Report by the Engineer and General Manager.

Mr. A. Morton Fyffe, the recently appointed Engineer and General Manager of the Blackburn Corporation Gas-Works, has prepared a report for the Gas Committee, in which he sets forth the present position of the undertaking, and steps which should be immediately taken to improve the condition of affairs.

He deals with the matter from five aspects. The first is that, even with a comparatively high price charged for gas, the department has recently failed to meet its obligations financially. As to this, he merely points out that at March, 1913, there was a reserve fund of £21,022, which has not only been entirely wiped out, but debited with a loss of £3325 carried forward into the current year.

The second point is that all the works are so altogether inefficient and in such bad repair that large sums of money will be required to bring the plant and machinery into even normal working condition. He remarks that the present state of the works can only be characterized as precarious, and is being dealt with now in order that they will be capable of meeting the demands of the coming winter, though it is impossible to say with certainty that an adequate or satisfactory supply of gas can be assured throughout next winter. A summary is given of repairs and renewals at the Greenbank works; the estimated cost being £3200, including £2000 for repairs to the retort-bench. The works at Addison Street, with the exception of the carburetted water-gas plant, which is in a bad condition, are in very much better order than the Greenbank works, and with a general overhaul can be put in fair working condition.

On the third aspect of the matter—that the unprecedented advance in prices of all raw materials for the manufacture and distribution of gas and bye-products renders it necessary that the price of gas should be immediately increased—Mr. Morton Fyffe says that, in order to prove the necessity of an advance in the price of gas, a statement is given showing the additional cost of carrying on the Gas Department during the current year, as compared with the last financial year:—

Extra cost of coal	£9,000	
Do. gas oil	3,000	
Do. repairs	2,000	
Do. soldiers' dependants	1,150	
Do. sulphuric acid	875	
Do. wages and carting	850	
Do. all materials such as lead pipes, iron pipes, gas-fittings, oils, stores, &c.	2,200	
		£19,075
Plus—		
Less revenue from tar	£1,400	
Do. gas	2,000	
		3,400
Gross extra cost		£22,475
Minus—		
Increased revenue from coke	£3,500	
Do. sulphate	460	
		3,960
		£18,515
Plus—		
Net loss on last year's working		6,618
Estimated total loss on current year's working under present conditions		£25,133

An increase of 1d. per 1000 cubic feet in the price of gas from the commencement of next quarter to the end of the financial year is estimated to result in an increased revenue of £1745. He recommends that the price be raised 7d. per 1000 cubic feet, which would make the price 3s. 4d., less discount, or 3s. 2d. net. This increase of 7d. would mean that the slot-meters would not require to be altered, but simply that the present discount of 7d. would not be given. The total estimated increased revenue by this advance of 7d. during the last two quarters of the financial year would be £12,215. This would still show an apparent loss of £12,918 on the year, part of which it is hoped will be saved by economy in working; and the balance of the loss could be carried forward to the next year, in the hope that a return of normal times in the country would enable the department to retrieve its position.

Next it is pointed out that, as at the present time the introduction of modern plant is impossible, the undertaking must be conducted with the greatest efficiency and economy practicable under the existing conditions. This, the report says, is the problem of the moment. At present there is practically no organization in the department; and it is when the working results come to be considered that the lack of supervision and organization shows its effect. As an instance, it is remarked that the sulphate of ammonia made during the last financial year works out at 16·16 lbs. per ton of coal carbonized; whereas the average in Lancashire is about 24 lbs.—a difference which would be worth about £2000 per annum to the Department. As to carbonizing costs, Mr. Morton Fyfle says: At the Greenbank works during May, ten out of 21 beds of retorts were at work; and the cost of carbonizing was 2s. per ton of coal, which is much too high, although partly accounted for by the deplorable condition of the retorts, mains, ascension-pipes, conveyors, &c. At the present time, the Greenbank-works being closed-down for repairs, all the gas required is being made at the Addison Street works, where six beds of retorts are at work along with the carburetted water-gas plant. These six beds of retorts are carbonizing 80 tons of coal per day, or 560 tons per week; and as 37 men per day are employed on this work, the cost of carbonizing a ton of coal is 2s. 11d. This is the retort-house in which modern electrical stoking and discharging machinery was installed ten years ago; and to-day the working costs are more than they would be if all the work was done by hand. When it is considered that the 80 tons of coal used per day is placed into the retorts and ejected therefrom by machines, and also the coke coming out to be dealt with is only about two-thirds of the weight of the coal—say, a daily total of 53 tons of coke—it is seen that on the average each man has to deal with only 29 cwt. of coke during his eight-hour shift. Considered from any standpoint, this cannot be justified; and the position must be faced and remedied. The wages of these men average 41s. 10½d. per week of 56 hours.

Another serious fact, he continues, is the declining consumption, which, if allowed to go on, will render the financial position of the department more precarious than ever. Owing to the station-meter having been out of order, it is impossible to say how much gas was made from April to June, and consequently impossible to tell what the consumption has been; but there is good reason to believe that the consumption has decreased to a much greater extent than can be ascribed to the diminution of public lighting. During the past few weeks, since the meters have been repaired and tested, it has been found that the decrease in consumption as compared with the same time last year is about 8 per cent. This is an indication of the necessity for the adoption of commercialism, because the only way to neutralize the effect of the heavy capital charges is to increase the consumption of gas; and in this connection it should be remembered that the increase of consumption from existing consumers is much more profitable than increased consumption from new consumers, desirable though the latter is. For instance, one gas-fire will generally bring a consumption of 10,000 cubic feet per annum; and when every gas consumer in Blackburn uses 10,000 feet more gas per annum, the problem of the Gas Department will be largely solved, and the anxiety of those responsible for the undertaking greatly minimized. In order to show that an increased consumption of 10,000 cubic feet per consumer per annum is quite attainable with time and work, the average consumption per consumer in various towns having municipal gas undertakings is given.

Southport	32,194	cubic feet per consumer per annum.
Manchester	31,084	,, ,, ,,
Oldham	30,056	,, ,, ,,
Bradford	28,992	,, ,, ,,
Nottingham	27,645	,, ,, ,,
Nelson	27,354	,, ,, ,,
Burnley	27,119	,, ,, ,,
St. Helens	27,076	,, ,, ,,
Halifax	26,422	,, ,, ,,
Stockport	25,873	,, ,, ,,
Leeds	22,836	,, ,, ,,
Salford	22,554	,, ,, ,,
Bolton	20,830	,, ,, ,,
Blackburn	18,668	,, ,, ,,

These figures will, it is added, also be of use to the Committee in considering the advisability of becoming subscribers to the British Commercial Gas Association.

The fifth and final aspect is that before modern plant can be installed, a very large capital expenditure will be involved; and as the capital of the undertaking is already double what it should be, it is necessary that all future capital expenditure should be of such a nature as to be self remunerative. On this head, the General Manager says that there can be no doubt that, under the present arrangement of the works, the Blackburn Gas Department can never be made a success; and there must be some drastic changes throughout the department, which will involve considerable capital expenditure. But the care necessary in dealing with future capital expenditure is best shown by the appended tabulation of the capital of the Blackburn undertaking as compared with that of other corporation undertakings.

There can be no doubt of the advisability of transferring all the manufacturing to the Greenbank works; while Addison Street would be the gasholder station, with meter, stove, and fitting workshops. Attention would thus be concentrated on the Greenbank works, where a large installation of vertical retorts should be proceeded with at the earliest possible date, as there can be no doubt that the retort-bench at the Greenbank works will now never be satisfactory after the treatment it has received, while vertical retorts are desirable for every possible reason.

There is no difficulty, so far as ground space is concerned, in transferring all the manufacturing to Greenbank, as the department owns 49 acres of land there, which is far in excess of what Blackburn will ever require for gas-works purposes. At the present time, the maximum output of gas is about 4,000,000 cubic feet per day; and at one of the Manchester gas-works, having an area of 8 acres, the producing capacity is 6,500,000 cubic feet per day, while at another works in Manchester the area is 7 acres and the producing capacity is 7,500,000 cubic feet per day.

Town.	Gross Capital of Undertaking.	Capital Charges.	
		Amount per Annum.	Amount per 1000 Cubic Feet of Gas.
	£	£	d.
Birmingham	2,581,947	120,836	3·08
Bolton	800,062	27,600	6·23
Bradford	1,212,407	54,991	6·29
Bury	338,851	14,736	8·45
Carlisle	149,777	3,422	2·42
Colne	125,894	6,066	8·51
Darlington	209,023	7,023	4·49
Darwen	224,001	8,878	9·85
Doncaster	145,522	4,630	3·53
Halifax	651,334	26,292	7·58
Keighley	148,539	6,988	4·62
Leeds	1,910,778	42,917	3·96
Leicester	1,395,339	58,367	6·44
Lincoln	241,757	7,647	4·91
Manchester	3,005,825	102,136	4·26
Nelson	237,145	14,708	8·76
Nottingham	1,186,064	53,990	5·75
Oldham	726,650	28,172	4·41
Rotherham	212,455	9,588	7·47
Salford	980,965	35,047	5·07
Smethwick	232,057	10,980	4·80
Southport	307,003	13,744	5·92
Stafford	113,156	2,729	2·76
Stockport	515,323	19,543	5·50
Wallasey	340,491	17,338	6·36
West Bromwich	256,000	8,955	5·86
Widnes	176,802	4,569	2·36
Wigan	398,783	18,423	9·26
Blackburn	790,903	32,838	11·31

LIGHTING ARRANGEMENTS AT WESTMINSTER.

The contract under which the Gas Light and Coke Company supply the public lamps in various parts of the City of Westminster will expire in November next; and the Works Committee of the City Council have had under consideration the arrangements to be made consequent thereon. The Committee think that the present is not a suitable time for inviting competitive tenders for a new contract for a term of years, as the disturbance of economic conditions caused by the war renders it difficult, if not impossible, for contractors to anticipate what might be fair prices in years to come.

For this reason negotiations have taken place with the Company with a view to a continuance of the expiring contract for a short period; and, subject to confirmation by the Council, the undermentioned arrangements have been agreed upon:

(*a*) The Company's allowances in respect of reduced lighting up to the end of the June quarter to be accepted by the Council.

(*b*) The Company to allow the sum of £1300 in respect of the reduced lighting for the period from the end of the June quarter to Nov. 15 next—any substantial modification to be the subject of mutual agreement.

(*c*) As from Nov. 15 the standard of light in all or any number of the units now employed may at the Council's option be reduced to two-thirds of the existing contract standards of minimum candle power—the Company making without charge any necessary alterations to the lamps specified by the Council to be reduced. The charges for the reduced units of light after Nov. 15 to be on a schedule submitted by the Company.

(*d*) After Nov. 15 allowances in respect of lamps left out of lighting or reduced in power beyond one-third of the present standard by order of the Government, to be calculated according to a schedule submitted by the Company.

(*e*) The Council to have the power at any time after Nov. 15 to revert to the existing contract standards of minimum candle-power in respect of the whole or any of the lamps—the payment in respect of any such lamps, and the allowances in respect of any such lamps temporarily extinguished or reduced in lighting by Government orders, to be according to schedules submitted by the Company. Any alterations of the lamps under this clause are to be made at the cost of the Company.

(*f*) The clauses of the existing contract relating to the testing of candle power and the imposition of penalties to be and remain suspended until one month after the removal of the Government restrictions in lighting.

(*g*) Save as modified, the existing condition of contract to stand.

(*h*) The arrangements above set out to continue in force until Dec. 31, 1916, or three months after the declaration of peace, whichever shall be the earlier.

The Company estimate that this arrangement will reduce the cost of public lighting after Nov. 15 by £3300 per annum, subject to modifications according to the increase or decrease in the price of gas to private consumers. This estimate presumably is dependent upon the present extent of diminution of lighting being continued. The Committee propose, however, to consider after the summer recess, in detail, the question of the general standard of reduction of light below the minimum standards provided by the expiring contract, so as to be able to ascertain more or less exactly the cost of the public gas lighting under the new arrangement, which (as above appears) is only a temporary expedient, but which, notwithstanding the great increase in the cost of gas production, they anticipate will effect a very substantial saving.

The Committee recommended that, subject to the submission of an estimate by the Finance Committee, and to their report later on the extent of light reduction to be effected, the temporary arrangement outlined by them should be adopted. This course the Council unanimously agreed to.

SCIENTIFIC AND INDUSTRIAL RESEARCH.

A Scheme for Organization and Development.

Particulars of a scheme for the organization and development of scientific and industrial research have been issued by the Board of Education, over the signature of Mr. Arthur Henderson. It will be seen from the following particulars taken from the document that the scheme provides for the establishment of a Committee as well as an Advisory Council.

There is, it is remarked, a strong consensus of opinion among persons engaged both in science and in industry that special need exists at the present time for new machinery and for additional State assistance in order to promote and organize scientific research with a view especially to its application to trade and industry. It is well known that many of our industries have since the outbreak of war suffered through our inability to produce at home certain articles and materials required in trade processes, the manufacture of which has become localized abroad, and particularly in Germany, because science has there been more thoroughly and effectively applied to the solution of scientific problems bearing on trade and industry and to the elaboration of economical and improved processes of manufacture. It is impossible to contemplate without considerable apprehension the situation which will arise at the end of the war unless our scientific resources have previously been enlarged and organized to meet it. It appears incontrovertible that if we are to advance or even maintain our industrial position, we must as a nation aim at such a development of scientific and industrial research as will place us in a position to expand and strengthen our industries, and to compete successfully with the most highly organized of our rivals. The difficulties of advancing on these lines during the war are obvious, and are not under-estimated. But we cannot hope to improvise an effective system at the moment when hostilities cease; and unless during the present period we are able to make a substantial advance, we shall certainly be unable to do what is necessary in the equally difficult period of reconstruction which will follow the war.

The present scheme is designed to establish a permanent organization for the promotion of industrial and scientific research. Is is in no way intended that it should replace or interfere with the arrangements which have been, or may be, made by the War Office or Admiralty or Ministry of Munitions to obtain scientific advice and investigation in connection with the provision of munitions of war.

The research done should be for the kingdom as a whole; and there should be complete liberty to utilize the most effective institutions and investigators available, irrespective of their location. There must, therefore, be a single fund for the assistance of research, under a single responsible body. The scheme accordingly provides for the establishment of—

(*a*) A Committee of the Privy Council responsible for the expenditure of any new moneys provided by Parliament for scientific and industrial research.

(*b*) A small Advisory Council responsible to the Committee of Council, and composed mainly of eminent scientific men and men actually engaged in industries dependent upon scientific research.

The Committee of Council will consist of the Lord President, the Chancellor of the Exchequer, the Secretary for Scotland, the President of the Board of Trade, the President of the Board of Education (who will be Vice-President of the Committee), the Chief Secretary for Ireland, together with such other Ministers and individual members of the Council as it may be thought desirable to add. The first non-official members of the Committee will be: The Right Hon. Viscount Haldane of Cloan, O.M., K.T., F.R.S., the Right Hon. Arthur H. D. Acland, and the Right Hon. Joseph A. Pease, M.P.

A great part of all research will necessarily be done in universities and colleges which are already aided by the State; and the supply and training of a sufficient number of young persons competent to undertake research can only be secured through the public system of education.

The primary functions of the Advisory Council will be to advise the Committee of Council on—

1. Proposals for instituting specific researches.
2. Proposals for establishing or developing special institutions or departments of existing institutions for the scientific study of problems affecting particular industries and trades.
3. The establishment and award of Research Studentships and Fellowships.

The Advisory Council will also be available, if requested, to advise the several Education Departments as to the steps which should be taken for increasing the supply of workers competent to undertake scientific research. Arrangements will be made by which the Council will keep in close touch with all Government Departments concerned with, or interested in, scientific research, and by which the Council will have regard to the research work which is being done, or may be done, by the National Physical Laboratory.

It is essential that the Advisory Council should act in intimate co-operation with the Royal Society and the existing scientific or professional associations, societies, and institutes, as well as with the universities, technical institutions, and other institutions in which research is or can be efficiently conducted. It is proposed to ask the Royal Society and the principal scientific and professional associations, societies, and institutes to undertake the function of initiating proposals for the consideration of the Advisory Council; and a regular procedure for inviting and collecting proposals will be established. The Advisory Council will also be at liberty to receive proposals from individuals, and themselves to initiate proposals. All possible means will be used to enlist the interest, and secure the co-operation, of persons directly engaged in trade and industry.

It is contemplated that the Advisory Council will work largely through Sub-Committees reinforced by suitable experts in the particular branch of science or industry concerned. On these Sub-Committees it would be desirable, as far as possible, to enlist the services of persons actually engaged in scientific trades and manufactures dependent on science. As regards the use or profits of discoveries, the general principle on which grants will be made by the Committee of Council is that discoveries made by institutions, associations, bodies, or individuals in the course of researches aided by public money shall be made available under proper conditions for the public advantage.

It is important, in order to secure effective working, that the Advisory Council should be a small body; but it is recognized that, even if full use is made by the Council of its power to work through reinforced Sub-Committees, its membership may be found to be inadequate to do justice to all the branches of industry in which proposals for research may be made, or to the requests of other Government Departments for assistance. It is therefore probable that it will be found necessary to strengthen the Council by appointing additional members. The first Members of the Council will be: The Right Hon. Lord Rayleigh, O.M., F.R S., LL.D., Mr. G. T. Beilby, F.R.S., LL.D., Mr. W. Duddell, F.R.S., Prof. B Hopkinson, F.R.S., Prof. J. A. M'Clelland, F.R.S., Prof. R. Meldola, F.R.S., Mr. R. Threlfall, F.R S., with Sir William S. M'Cormick, LL.D., as Administrative Chairman.

The Advisory Council will proceed to frame a scheme or programme for their own guidance in recommending proposals for research and for the guidance of the Committee of Council in allocating such State funds as may be available. This scheme will naturally be designed to operate over some years in advance; and in framing it the Council must necessarily have due regard to the relative urgency of the problems requiring solution, the supply of trained researchers available for particular pieces of research and the material facilities in the form of laboratories and equipment which are available, or can be provided, for specific researches. Such a scheme will naturally be elastic and will require modification from year to year. But it is obviously undesirable that the Council should live "from hand to mouth" or work on the principle of "first come first served;" and the recommendations (which for the purpose of estimating they will have to make annually to the Committee of Council) should represent progressive instalments of a considered programme and policy. A large part of their work will be that of examining, selecting, combining, and co-ordinating, rather than originating. One of their chief functions will be the prevention of overlapping between institutions or individuals engaged in research. They will, on the other hand, be at liberty to initiate proposals, and to institute inquiries preliminary to preparing or eliciting proposals, for useful research; and in this way they may help to concentrate on problems requiring solution the interest of all persons concerned in the development of all branches of scientific industry.

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SEVILLE WATER-WORKS COMPANY, LIMITED.

The Annual Meeting of this Company was held last Wednesday at the London Offices—the Chairman (Mr. Cowley Lambert) presiding. The report of the Directors announced that the income for the year ended March last amounted to £46,366. After deducting working expenses, the cost of laying on services and interest on debentures, the net profit was £11,286, as compared with £10,694 in the previous year. Adding to this the unappropriated profit of £6647, the amount standing to the credit of profit and loss account was £17,929. The Board deeply regretted the unavoidable delay in carrying out the new works for the filtered river water supply. This was caused by the financial position created by the war, and by the refusal of the Treasury to sanction the raising of further capital in this country for the purposes of the Company. The Board were not yet in a position to speak with regard to the success or otherwise of their endeavours to raise the necessary funds in Seville for the prosecution of the works. The application lists were being kept open; and the Manager (Mr. John I. Bithell) was not without hope of securing financial support there. The Board were anxious to do all in their power to carry out the contract with the Municipality; and with this object in view, they had already expended considerable sums of money out of revenue. They considered it advisable to continue this policy; and, in view of this, notwithstanding the fact that the Company had earned a net profit of £11,286, they refrained from recommending the payment of any dividend at the present time. The Chairman, in moving the adoption of the report and accounts, noted the substantial increase in water-rentals, and made a strong appeal to the people of Seville, in view of the capital restriction powers in this country due to the war, to provide the capital for carrying out the new water scheme, in connection with which the pipe-laying work has been commenced. Mr. F. S. Jackson seconded the motion; and it was unanimously carried. It was explained by the Chairman, in reply to questions, that the money that was being spent on the scheme out of revenue and the carry-forward would be replaced out of capital when raised.

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Increased Price leads to Reduced Lighting at Kidderminster.—At last Wednesday's meeting of the Kidderminster Town Council, the General Purposes Committee reported that, as the tender of the Gas Company to light the public lamps for a year was 62s. per lamp, an increase of 10s. a lamp, the Committee proposed to reduce the number of lamps by about 130. Alderman Johnson regarded the charge as a very "exorbitant one," and not justified by the circumstances. Major Talbot said the wages at the gas-works had increased 42 per cent., and the price of coal 50 per cent. The Gas Company had made every possible concession to the Corporation. The Mayor hoped the Committee would have plenty of courage, and not be afraid of reducing the lighting. People in London and elsewhere soon got used to less light; and there had been no increase in accidents or crime. He did not think the reduction of 130 lamps was enough. The Committee were therefore asked to consider the matter further and report later on to the Council.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Important installations of new plant are in progress at the Forfar, Cupar, and Ayr Gas-Works. The Woodall-Duckham Vertical Retort and Oven Construction Company, Limited, are supplying the retorts. At Forfar, the contract consists of one bench of ten retorts, capable of dealing with 40 tons of coal per day of 24 hours, supplied complete with a steel-framed retort-house, and all coal and coke handling machinery. The equipment also includes a coal-breaker, a cased-in bucket elevator, and a push-plate conveyor and lift. In ordinary working, all the coal taken to the overhead storage hoppers above the bench (which will be of 48 hours' capacity) is raised by the bucket elevator and push-plate conveyor; but the lift will be so arranged that it can be used for elevating coal in case of a breakdown to the conveying plant. At the Cupar Gas-Works, one bench of six retorts is in course of erection, capable of dealing with 22½ tons of coal per 24 hours. It will be complete with a steel-framed retort-house and lift for coal and coke handling purposes. The new installation at Ayr by the firm named is now at work, and comprises one bench containing four settings, each of two retorts, together capable of carbonizing 40 tons of coal per 24 hours. It is complete with a steel-framed retort-house and lift for coal and coke handling purposes. This installation is specially arranged for future extensions to be carried out when coal and coke handling machinery can be installed.

The contracts clause in the Price of Coal (Limitation) Bill will bring about a saving to the Gas and Electricity Departments of the Corporation of Glasgow of between £50,000 and £60,000. The Gas Department bought 800,000 tons of coal at an increase of 5s. 3d. per ton over last year's prices; and the Electricity Department 170,000 tons at an increase of 6s. 3d. per ton.

The annual meeting of the Bo'ness Gaslight Company, Limited, was held on Monday—ex-Provost Ballantine presiding. The balance-sheet showed a profit of £907, compared with £720 the previous year; and the disposable balance at the credit of profit and loss was £1666, from which a dividend of 6 per cent. free of income-tax was declared—absorbing £847. The report of the Manager (Mr. James Campbell) showed that the gas made was 34,677,000 cubic feet—an increase of 2,465,000 cubic feet (7·55 per cent.)—while the sales increased by 3,515,800 cubic feet, the leakage having been reduced from 13·37 to 9·93 per cent. The gas made per ton of coal amounted to 10,220 cubic feet; and there were sold 8·01 cwt. of coke, and 46·48 gallons of tar and ammoniacal liquor per ton of coal carbonized. The receipts from residuals were equal to 55·83 per cent. of the cost of the coal.

The Brechin Gas Company are paying a dividend of 18s. per share. The Brechin works are connected-up with Edzell, the inhabitants of which golfing resort are now obtaining a supply of gas at a much lower price than they had been accustomed to pay. In this district of Forfarshire, the increases per 1000 cubic feet in the price of gas this year are as follows: Brechin, 4½d.; Forfar, 6d.; Dundee, 7d.; Arbroath, 10d.; Monifieth, 10d.; Carnoustie, 6d.

At this week's meeting of the Glasgow Corporation, the Magistrates had before them a letter from the Secretary of the Glasgow and West of Scotland Armaments Committee enclosing a copy of a letter addressed by the Committee to the Manager of the Smoke Abatement Exhibition, which is to be held in Glasgow in the autumn, and to which the Corporation have granted their patronage, suggesting that representations should be made to the promoters of the exhibition as to the desirability, in the circumstances, of postponing the holding of the exhibition. The Magistrates agreed to make no pronouncement on the subject.

The report for the year ended May 31, which was submitted at a meeting of the Finance Sub-Committee of the Glasgow Electricity Committee last Wednesday, stated that the revenue account continues to show favourable results; an increase of income from all sources of £27,057, despite the abnormal conditions prevailing, being regarded as most gratifying. Contracts have been entered into for the supply of coal for the current year at prices very considerably in advance of those of last year. Having in view this serious increase in working costs, and increased amounts payable for interest, sinking fund, and rates and taxes, and a general advance in the cost of all materials required during the coming year, the Sub-Committee agreed to recommend that rather than alter the existing scale of charges, 15 per cent. be added to all accounts from the date of the last survey. The charges for current for the year 1915-16 will therefore be the same as last year, *plus* the 15 per cent.

Gas and Air Appliances Company, Limited.—A Leicester Company bearing this title was registered last week, with a capital of £5000, in £1 shares.

Leatherhead Gas and Lighting Company.—The Directors' report for the year ended June 30 states that the receipts amounted to £18,865, and the working expenses to £14,659, leaving a profit of £4207, to which is added £1759 brought from the previous year—making a total of £5966. Deducting interest on loans and debenture stock, income-tax, and the interim dividend paid in February (£2491 in all) there is a balance of £3474 now available for division among the shareholders. The Directors recommend the payment of a further dividend, making 5 per cent. for the year—absorbing £1528, and leaving £1945 to be carried forward. The sale of gas advanced from 64 to 71 million cubic feet—an increase at the rate of about 10 per cent. The Company's Consulting Engineer (Mr. F. S. Cripps, Assoc.M.Inst.C.E.) reports that the apparatus at the gas-works has been maintained in an efficient condition. Two new settings of retorts have been erected, and other necessary renewals and repairs carried out. The supply of gas through the high-pressure main has proved satisfactory. The increase in the demand for gas necessitated the laying of some larger mains; and about 500 yards of 8-inch and 1000 yards of 6-inch mains have already been laid. An 8-inch main is in progress along the Byfleet Road to replace the 5-inch main sold to the Walton and Weybridge Gas Company. About 400 yards of 3-inch and 4-inch mains have been laid.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 30.

The prices of tar products in the London market as recorded last week remain practically unchanged. Pitch is 26s. per ton in bulk, with a fair inquiry. Creosote remains at 4¼d. per gallon net in bulk. There is a very good demand for solvent naphtha, and the price is firm at 2s. to 2s. 3d. per gallon.

Sulphate of ammonia is unchanged at £14 8s. 9d. per ton net, into buyers' bags at makers' works, for 25 per cent. minimum quality.

Tar Products in the Provinces.

July 31.

The markets for tar products still remain fairly steady. There is practically no business doing in pitch, owing to the uncertainty in freights and buyers' ideas being somewhat lower than those on this side. Solvent and heavy naphthas continue in good demand. Creosote is quiet, and very little business is reported.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 6d. to 25s. 6d. Pitch, East Coast, 22s. to 23s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. to 24s. Clyde. Benzol, 90 per cent., naked, North, 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3d. to $3\frac{1}{16}$d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 6d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *July* 30.

Owing to the Government refusing to issue further licences for the export of this material to certain destinations until they have made inquiries, the market has been inactive throughout the week, but no quotable change has taken place in prices. The nearest values to-day are still £14 13s. 9d. f.o b. Hull, £14 16s. 6d. f.o.b. Liverpool, and £15 1s. 3d. per ton f.o.b. Leith. The dulness in the near position has tended to deter buyers from operating for future delivery, but makers have continued firm in their views at £15 2s. 6d. to £15 5s. per ton at the principal ports for October-March shipment.

Nitrate of Soda.

During the past week this market has remained quiet but steady at 12s. 3d. per cwt. for ordinary, and 12s. 6d. for refined quality on spot.

Sulphate of Ammonia.

From another source it is reported that there is no change in this article. Sales have been very quiet during the past week. Outside London, makes are quoted at £13 15s.; Hull, £14 15s.; Liverpool, £14 17s. 6d.; Leith, £15; Middlesbrough, £14 15s.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade in the north-east is rather firmer, and there is a better inquiry for some classes of fuel, so that, with the limitation of the output by the holiday, prices seem stiffer. In the steam coal trade, the producers have fairly full order books; and for early delivery there is a strong demand. Best Northumbrian steams are from 21s. to 21s. 6d. per ton f.o.b.; and for second-class steams the current price is about 16s. 6d. per ton. For steam smalls, the price varies from 13s. to 15s. per ton. The latter class seem more in request; and the tendency of prices is on the whole firmer, though the output appears to be now fully an average one. There is a good demand for this season of the year for gas coals, and the production is readily taken up, though the home consumption is naturally slow just now. Best Durham gas coals are from 20s. 6d. per ton f.o.b.; and for second-class gas coals about 17s. per ton is the current quotation. For "Wear Specials," 21s. per ton f.o.b. is the usual price at present. The freight rate is quiet, with gas coal from Tyne to London at about 7s. to 7s. 1½d. Little is doing in contracting at the present time. It is not thought that the Price of Coal (Limitation) Act will have much actual influence on gas coal contracts, but it may slightly relax forward prices. Coke is generally firm. For good gas coke, the quotation is from 26s. to 27s. per ton f.o.b.—figures relatively high to those for furnace coke.

Manchester Electrical Undertaking.—Notice has been given by Councillor Clyne that he will move the following resolution at to-morrow's meeting of the Manchester City Council: "That a Special Committee of members of the Council, other than members of the Electricity Committee, be forthwith appointed for the purpose of making inquiry into the working and control of the Corporation electrical department; and that an independent expert in electricity, who is associated with the control of some large electrical concern run on business lines, be engaged by such Special Committee to advise. That they be empowered to hear the views of citizens who may be either favourable or unfavourable to the present and (or) prospective policy of the Electricity Committee; and that they shall report to the City Council as to the necessity or otherwise, in their judgment, of certain proposals being forthwith proceeded with or postponed until after the present period of national financial strain."

Gas Profits and the Rates at Smethwick.

At a meeting of the Smethwick Town Council last Tuesday, a resolution was moved by Mr. Morris to the effect that in future the annual contribution out of gas profits in aid of the rates be discontinued, and that in lieu of this the Gas Committee undertake free of charge to the Council the whole of the public lighting in the borough, including all expenses connected with lighting and maintaining the public lamps. The resolution was discussed at length, but was ultimately rejected by a large majority. The Chairman of the Gas Committee (Alderman Goodyear) said an application had been received for a supply of gas on a very large scale for manufacturing purposes; and along with it, they had been asked to reconsider the price. They anticipated that this would mean an output of about 6 million cubic feet per quarter; and he proposed that the scale of charges be extended so as to include an additional rate of 1s. 7d. per 1000 cubic feet for quantities of 4 million cubic feet per quarter and upwards. This was agreed to.

Bahia Blanca Gas Company, Limited.

Moving the adoption of the report and accounts at the annual meeting of the Company last Thursday, the Chairman (Mr. J. C. im Thurn) said the result of the year's working, after meeting interest on loans, was a debit balance of £2294. The expenditure side of the revenue account had been reduced by no less than £1920; but this was offset by the decrease in receipts—chiefly under the heading of sales of gas. The Manager (Mr. A. M. Hunter) said his staff had done good work under most depressing and trying conditions. The cordial relations maintained with the municipal authorities, and the satisfaction customers expressed at the manner in which they were served, were entirely due to the vigilance and attention of the officers. The City of Bahia Blanca was an exporting port for the grain crops of the southern part of the Argentine Republic; and if these failed, the business of the town came to a standstill. This unfortunately had been the case for the past four or five years; and accordingly the town had suffered in a manner that could scarcely be understood in England. In consequence of the sudden prohibition of coal exports from this country, the Board had to make the best arrangements possible in order to keep the works going. Stocks were sufficient to last until about February next, which, all things considered, was very satisfactory. The high price would certainly still further handicap the Company; but this was unavoidable. It appeared certain that some method of reconstruction would be the best way of placing the Company upon a more satisfactory basis. Reports from Mr. Hunter dealing with the prospects for the immediate future were of an encouraging character; and if, as he was sure they all hoped, the coming harvest was a good one, he trusted the town would at last begin to recover. The report was adopted; and a hearty vote of thanks was passed to the Chairman, Directors, and staff.

Gas Price at Lurgan.—The Lurgan Gaslight and Chemical Company, Limited, have raised the price of gas from 3s. 10d. to 4s. 2d. per 1000 cubic feet.

Malvern Municipal Undertakings.—Reporting on the financial operations of the reproductive undertakings of the Malvern Urban District Council during the past twelve months, Mr. Edward Stevens (the District Auditor) says that on the gas undertaking, the year's trading showed a loss of £165, as compared with a profit of £1619 in the previous year; and the loss on the water undertaking was £3066, as compared with a loss of £1807. In both cases this was mainly due to a falling off in receipts. It was to be noted, in regard to the gas undertaking, that the increased arrears of rentals, &c., amounted to no less than £970; so that the position would have been very different had the collection been as good as it was last year. The electricity undertaking showed a profit of £824, as compared with one of £317 in the preceding year.

Instruction in Munition Making at Cardiff.—The members of the Cardiff City Council were informed at their meeting last Wednesday that, by the kindness of the Gas Company, through the Secretary and General Manager, Mr. George Clarry (who is also a member of the Technical Education Committee), valuable facilities had been offered to afford instruction in munition making. The Company had given premises free of rent and charges, with plant, &c.; but it would be necessary to appoint an instructor. There were, it was stated, some 500 engineering apprentices in the schools of the Committee, who, with a little training, could be turned into useful workers. The local Munitions Committee had expressed their delight at the proposal; and the Council were asked to sanction expenditure not exceeding £250. The Board of Education would give grants which would help materially; and they had issued an urgent circular on the subject. The expenditure was agreed to.

Price of Gas Advanced at Hebden Bridge.—At a meeting of the Hebden Bridge and Mytholmroyd Gas Board last Thursday, the question of increasing the price of gas was given full consideration. There was a recommendation from the Works Committee that the price should be increased 3d. per 1000 cubic feet. After this had been proposed, Mr. Grindrod asked if an increase of 3d. would be sufficient to meet the increased cost of production. He said he learned that the Board had at the present time a debit balance at the bank. The Chairman (Mr. Charles Robertshaw) replied that the Committee had not considered the question of raising the price further when the coal advances came into operation. It was necessary to raise the cost to meet the present increased price of coal and also the extra sinking fund on the money spent during the last few years. The Committee were unanimous in fixing the increase at 3d. They made the move well knowing that most Boards in the country had increased the price 6d. per 1000 cubic feet. The recommendation was confirmed; and the price of gas after September will be 3s. 3d. per 1000 cubic feet.

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Street Lamp-Posts.

Referring to possibilities in connection with street lamp-posts, the "Sanitary Record" says: The ordinary street lamp-post is not exactly a thing of beauty, although from a utilitarian point of view it may be a joy; but there is no reason why it should not be utilized to a wider extent than is at present the case, and for purposes other than that of merely illuminating roads and pavements. It is true that something in this direction has already been done. In many parts of London and in provincial towns and cities, the lamp-post not only indicates the name of the street, but points the way to the nearest cab-stand, tramway starting-point, fire-station, railway station, or other building. It is also made to serve the purpose of an indicator to direct the wavering wayfarer to some place of worship, or else to the nearest convenient public bath and wash-house—the ultimate aim in each case being the acquirement of purity in some shape or form. There is really no reason why the capabilities of the lamp-post as a useful public servant should stop here. Lamps at prominent crossing-places, at the beginning and in the middle of leading thoroughfares, might quite well be equipped with a metal tablet displaying in bold characters the nearest police station, doctor, post, telegraph, and telephone office, ambulance station, fire hydrant, and even the position of the nearest policeman on point duty. Where electricity is employed, this information might be inscribed on a glass panel and illuminated at night with but little extra cost. The suggestion is so simple and obvious that it is surprising it has not been generally adopted; but it has ever been the rule that the simpler the innovation, the less likely it is to come into general utility. It certainly seems so in this case.

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Price of Gas at West Bromwich.—In consequence of the increase in the cost of material, &c., the price of gas of the West Bromwich gas undertaking has been advanced 6d. per 1000 cubic feet as from the June accounts.

London County Council Gas Examiners.—In a report adopted by the London County Council at their meeting last Tuesday, the Public Control Committee stated that the change in the duties of some of the gas examiners, consequent upon the abolition of penalty illuminating power tests in the case of the Gas Light and Coke Company, rendered it necessary to reconsider the approved scheme for the appointment of examiners. After full consideration, they were of opinion that part-time examiners only should be employed; and they had accordingly framed proposals intended to lead to the ultimate formation of a pane of gas examiners of whom a sufficient number would be employed from time to time at daily rates of pay—"thus furnishing an adequate number of experts for use in every contingency, and ensuring sufficient control over the avoidance of undue risk of error in gas examiners' reports." The recommendations adopted by the Council, included one that the remuneration for duty in the area of the Gas Light and Coke Company should be 10s. a day, and at other stations 10s. 6d.

Battersea Bridge Damaged.—The L.C.C. Highways Committee have reported that on the 2nd ult., the s.s. "Wandle," belonging to the Wandsworth, Wimbledon, and Epsom District Gas Company, ran into an arch of Battersea bridge, rendering useless two outside ribs of the arch on down-stream side, and breaking a large quantity of ornamental cast-metal face work. Road traffic on one side of the bridge had to be immediately stopped; and this course involved the suspension of the tramway traffic on one line of rails. They suggested that an estimate of £1000 should be approved in respect of the cost of repairs to be carried out during the summer recess. This was a provisional amount, pending the ascertainment of the actual cost of making good the damage to the bridge.

Aldershot Gas, Water, and District Lighting Company.—In the report to be presented at the half-yearly meeting next Friday, the Directors state that the total revenue for the six months to June 30 was £51,456, and the expenditure £39,785, leaving a surplus of £11,671. After providing for the preference dividend and interest charges, the Board recommend payment of the full statutory dividends on the "A," "B," and "C" stocks. The sale of gas for all purposes has increased 26·89 per cent.; and the sale of water has also advanced. The output of electricity was 12,149 units for the first half-year's working, and the future of this department promises to be successful. Residuals have been better; but the extra price for coal neutralizes any benefit. The prospects for coal, oil, and other commodities used in the Company's various undertakings does not appear too rosy.

Maidstone Gas Company.—The ordinary yearly meeting of the Company will be held on Thursday, when the Directors will submit the report and statement of accounts for the year ended June 30. The war has entirely upset the balance of trade conditions, the report points out, and affected the Company in a variety of ways. The scarcity of tonnage, and difficulties in connection with transport, resulted in a considerable shortage in the deliveries of coal bought under contract. In order to ensure the maintenance of the supply of gas, the Directors were forced to purchase coal in the open market at considerably higher rates. This necessitated an increase in the price of gas of 3d. per 1000 cubic feet as from the readings of the meters for the March quarter. The sales of gas showed a satisfactory increase of 3 per cent. over the previous year; this result being partly due to the billeting of troops in the town during the winter months. In the early part of the financial year coke prices were below the normal; but for the last six months the conditions applying to coal gave the coke market a favourable turn. After providing for all fixed charges (including £2000 depreciation in respect of stoves and fittings, and £1831 to the renewal fund), there remains an available balance of £15,630; and the Directors recommend a dividend of 6 per cent. for the half year to June, which, with the interim dividend paid last March, makes 7 per cent. for the year. The installation of mechanical stoking machinery, it is mentioned, was completed in the autumn of last year and is working satisfactorily. The Directors record with satisfaction that thirty of the Company's employees are at present serving with the Colours.

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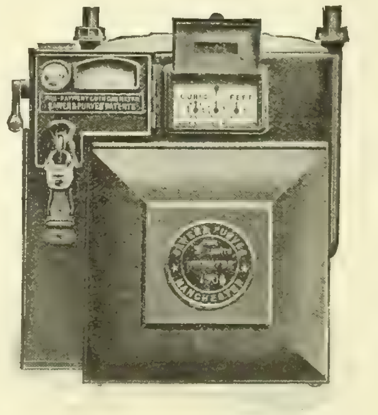

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Smyrna Gas-Works.—An "Evening News" telegram stated last week that bombs were dropped by Allied aëroplanes on the Smyrna Gas-Works, putting the town in darkness. The Ottoman Gas Company state that they cannot obtain confirmation of this report.

Dearer Gas at Ripon.—It has been decided by the Ripon City Council to raise the price of gas from Oct. 1 next 5d. per 1000 cubic feet—from 2s. 11d. to 3s. 4d., with discounts of 2½, 5, 7½, and 10 per cent., and that the discount for automatic consumers be reduced from 2d. to 1d. in the 1s. It was pointed out that the increase in expenditure is a very serious item. The estimated increase in the cost of coal for the ensuing year is £960, and on wages, materials, &c., £400.

Glass from Denmark.—The following reply, by Mr. P. Andresen (the London Representative of the Danish Glass Manufacturers), has been published in "The Times" to a letter in which the writer said he had never before seen a "Danish-made lamp chimney" [*ante*, p. 212]: I am happy to have the opportunity of taking up the challenge thrown down by Mr. Charles D. White with regard to the alleged German lamp chimney. If, as Mr. White says, he has lived in Denmark, I fear that he must have been most unobservant, and that his knowledge of the glass-making industries of Denmark is *nil*. Denmark can boast of many important glass factories, most of which are now amalgamated in one big company, the United Glass-Works, of Copenhagen. Another glass-works, formerly belonging to the Government, has been working for over a hundred years. With regard to the shape of the chimney, one would have thought that even a Devonshire village chandler would know that lamp chimneys must always be made precisely to one definite pattern for certain specific burners; otherwise a smoky flame would result. The ring and the words stamped on the glass are put there by special request of the buyer, in order to satisfy trade conservatism. I am entirely at the service of Mr. White, or any of your readers, to prove that important glass-works do exist in Denmark; and I should no doubt be able to tell him in which particular factory the lamp chimney was made if he would produce it to me.

Proposed Labour Board at Birmingham.—The General Purposes Committee have been directed by the Birmingham City Council to consider the appointment by the Council of a Labour Board, having authority to determine the question of wages of workmen employed by the Corporation, the conditions of their employment, and their transference from one department to another. There has for several years been in existence a Joint Committee on Labour; but in operation two obstacles have been found to the effectual working of this body. In the first place, the Committee is too large; and in the second, it has no authority to enforce its recommendations.

Loans for Expenditure already Incurred.—In giving their formal approval to the borrowing of £15,936 for electricity purposes by the York Electricity Committee, the Local Government Board write that they have decided, though not without much hesitation, to sanction loans in respect of the expenditure already incurred, or to which the Town Council are committed. The Board view with great dissatisfaction the action of the Town Council in incurring this expenditure in anticipation of sanction; and they again warn the Council to avoid this irregular procedure, "as it will not be possible for the Board to be satisfied with repeating their warning in similar cases in future."

Gas Charges at Halesowen.—The reduced lighting during last winter in the Halesowen district has, it is said, led to a dispute between the Rural Council and the Halesowen and Cradley Heath Gas Companies. In accordance with a request from the military authorities a large number of the public lights were extinguished; and the Halesowen Company have made an allowance of £85 16s. and the Cradley Heath Company one of £50 11s. in respect of these lamps. The Rural Council, having considered the particulars supplied to them by the two Companies, have declined to accept the amounts, and have requested the Halesowen Company to make an allowance of £172 and the Cradley Heath Company one of £100. If the dispute is not settled on these terms, the Council threaten to cut off the whole of the public lighting during next winter.

GAS COMPANIES IN THE STOCK EXCHANGE.

Business on the Stock Exchange last week was naturally curtailed by the closing of the House from Friday till the Tuesday after August Bank Holiday. But the brief period had exceptional interest, as the market in the new War Loan was thrown open on Thursday. This had been so much discussed and looked forward to that the result was perhaps a little disappointing. Under a couple of hundred bargains was the sum-total of transactions, and the aggregate amount of stock changing hands was comparatively inconsiderable. The price, *cum* rights, was 98½ to 99½. The general tone of the week was satisfactory. The old War Loan fluctuated at times, but gained on balance. Home and Colonial Government issues were steady. Home Rails and Americans showed some improvement, and lines connected with warlike apparatus advanced. Among these miscellaneous adventures, the Canadian Car Company had quite a sensational boom. The Government of India will invite subscriptions at par to a £3,000,000 loan at 4 per cent.—½ per cent. less than the British War Loan. Business in the Gas Market was of the quietest description, and prices showed no inclination to move. Another batch of companies' accounts for the June half year are out, and, although not all are equally gratifying, the general results go to show that, having regard to the exceptional circumstances of the period, reasonable expectations have been met. The Money Market was brisk and active, and discount rates were steady.

Bargains done for cash during the week were as follows: On Monday, Gas Light preference 71, 71½, ditto debenture 60, South Metropolitan 84. On Tuesday, Bombay 5¼, Brentford debenture 80, 80½, Gas Light ordinary 80½, ditto preference 71, 71½, ditto debenture 60, 60½, 61, South Metropolitan 84. On Wednesday, Bombay 5¼, Commercial debenture 60, Gas Light ordinary 80¾, 81, 81½, ditto preference 70¾, 71, ditto debenture 60½. On Thursday, European 12½, 12 9/16, Gas Light ordinary 80½, 81½, ditto preference 70¾, 71, ditto debenture 60½, South Metropolitan 83½. On Friday, Bournemouth debenture 11 1/32, 11 3/32, Gas Light ordinary 80¾, 81, ditto preference 71, ditto debenture 60¼, San Paulo debenture 89½, South Metropolitan 83½.

Bank rate (fixed Aug. 8, 1914), 5 per cent. Last year, the rate was raised on July 30 from 3 per cent. to 4 per cent. On July 31, it was raised to 8 per cent.; and on Aug. 1, to 10 per cent. On Aug. 6, it was lowered to 6 per cent.; and on Aug. 8, to 5 per cent., which has remained the rate ever since.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING JULY 31.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	..
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7½	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	5¼
50,000	10	Feb. 26	16	Bournemouth Gas and Water 10 p.c. . .	29—30	5 6 8	..
873,480	10	,,	7	Bournemouth Gas and Water B 7 p.c. .	15—15½	4 10 4	
95,000	10	,,	6	Bournemouth Gas and Water Pref. 6 p.c.	13½—14	4 5 9	11 1/32—11 3/32
—	—	—	—	Bournemouth Gas and Water Deb. . .	..	—	..
880,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
830,000	,,	,,	11	Do. New . . .	204—209	5 5 3	..
50,000	,,	,,	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	91—93	4 6 0	80—80½
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	,,	,,	8	Do. A Ord. Stk. .	154—159	5 0 8	..
530,000	20	Mar. 26	12½	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	Do. 4½ p.c. Pref. .	4—6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb.Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	..
560,000	,,	,,	5⅓	Do. 3½ p.c. do. .	103—105	5 1 6	..
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	60
800 000	Stk.	,,	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	,,	,,	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	Derby Con. Stk. . . .	123—125	4 16 0	..
55,000	,,	—	4	Do. Deb. Stk. .	102—104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd. . . .	17½—18	5 11 1	12½—12 9/16
6,362,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke 4 p.c. Ord. . .	98—102	4 15 6	80½—81½
2,600,000	,,	,,	3½	Gas Light and Coke 3½ p.c. max. .	76—79	4 8 7	..
4,062,235	,,	,,	4	Gas Light and Coke 4 p.c. Con. Pref.	96—99	4 0 10	70¾—71½
4,674,850	,,	June 11	3	Gas Light and Coke 3 p.c. Con. Deb.	72½—74½	4 0 6	60—61
130,000	,,	,,	10	Gas Light and Coke 10 p.c. Bonds .	..	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16¼—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c. . . .	..	—	..
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C . . .	151—154	5 2 4	..
65,780	,,	,,	6⅜†	Do. B	115—118	5 8 0	..
65,500	,,	June 26	4	Do. 4 p.c. Deb. . .	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental .	150—160	5 12 6	..
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c. .	119—121	5 7 5	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. A	211—213	4 13 11	..
718,100	,,	,,	7	Liverpool 5 p.c. Ord. B	146—14	4 14 7	
306,083	,,	June 26	4	Do. 4 p.c. Pr. Deb.Stk.	..	—	—

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d	
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd. . .	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	98½—99½	4 10 6	..
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	..
300,000	Stk.	May 14	8	Oriental, Ltd. . . .	117—122	6 11 2	..
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .	7¼—7¾	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B . .	128—131	4 19 3	..
100,000	50	,,	12	Do. C . .	118—121	4 19 2	..
52,000	50	,,	10	Do. D . .	..	—	..
249,980	5	April 29	8	Primitiva Ord. . . .	5½—6	6 13 4	..
499,960	5	June 26	5	,, 5 p.c. Pref. .	4¾—5	5 0 0	..
521,600	100	June 2	4	,, 4 p.c. Deb. .	91—93	4 6 0	..
—	—	—	—	,, ,, ,, 1911	..	—	..
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	San Paulo 5 p.c. Deb.	47—49	5 2 0	89½
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 3	..
209,984	,,	,,	10	Do. B	222—224	4 9 8	..
523,500	,,	,,	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African . . .	10½—11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	83¼—84
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	..
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	..
60,000	,,	,,	5	Do. 5 p.c. Pref. .	110—112	4 9 3	..
—	—	—	—	Do. West Kent. .	..	—	..
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord. . .	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c. .	135—138	5 8 8	..
742,275	,,	,,	6†	Tottenham District B 3½ p.c. .	115—117	5 2 7	..
181,255	,,	June 26	4	Tottenham District 4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	,,	,,	6⅞	,, B 3½ p.c.	129—134	5 2 7	..
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110—115	5 2 0	..
352,000	,,	,,	6⅛	Wimbledon 5 p.c. .	117—122	5 0 5	..
98,000	,,	,,	6⅝	Epsom 5 p.c. . . .	121—126	5 5 2	..
88,416	,,	June 26	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

Messrs. John Terry and Co. (as London Agents for the Company) have received from the Metropolitan Gas Company of Melbourne a cable advice informing them that the profits for the half year to June 30 were £104,344. A dividend of 6s. 6d. per share for the six months has been declared, a sum of £38,800 has been transferred to the reserve fund, and the balance carried forward is £36,600.

The Bradford City Treasurer (Mr. F. Ogden Whiteley), in his annual statement of accounts of the municipal trading undertakings of the city for the year ended March 31, states that the total income from all the undertakings was £1,037,537; and there was a net surplus of £39,517. The expenditure amounted to £7,592,017, of which £2,439,314 has been repaid. There is thus a net debt on the undertakings of £5,152,703.

When a proposal of the Gas Committee came before the Leeds City Council, to the effect that, in lieu of the provision of a motor-car for the General Manager (Mr. W. B. Leech), a quarterly allowance of £35 should be made to him for using his private car for official purposes, an amendment was moved that the matter be referred back. It was, however, pointed out that, in order efficiently to superintend the different gas-works, it was necessary that the Manager should visit them several times during the day and night; and the amendment was defeated by a large majority.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Sales Manager. 6075.
Draughtsman. 6073.
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Meetings.

Brentford Gas Company. St. Ermin's Hotel, Westminster. Aug. 6. 2.30 o'clock.

Plant, &c. (Second-Hand), Wanted.

Tower Scrubber and Coal Elevator. No. 6074.

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Coal.

Haverhill Urban District Council. Tenders by Aug. 10.
Wigan Gas Department. Tenders by Aug. 18.

Meters.

Dewsbury Gas Department. Tenders by Aug. 14.

Pipes.

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Tar.

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Sulphuric Acid.

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXXI., No. 2726.] TUESDAY, AUGUST 10, 1915. [67TH YEAR.

EDITORIAL NOTES.

Facing the Situation.

THE half-yearly meetings of gas companies are now in full swing; and there has been one outstanding feature at those which have come under our immediate observation. It is that the proprietors are facing the peculiar situation with good heart. They know that in the circumstances changes in trading conditions and issues were inevitable; they know that the best and most competent Board of Directors could not weather a storm of such protracted length and unprecedented character as that through which we are passing (and of which we cannot foretell the end) without incurring some temporary injury. Commonsense tells them all this; but a matter that must be most encouraging to Boards of Directors is that, at none of the meetings so far held, has there been a word of criticism of the actions of the Directors in legislating for these unparalleled times and in preparing for any eventuality. Peace-time criticisms of management appear very insignificant as we glance back at them in the light of this unqualified confidence in administrations doing the best possible in the sinister circumstances; and that confidence is in evidence on all hands. It was to be seen last Friday at the meeting of the Gas Light and Coke Company. The price of gas has returned to the figure that in peace times under the former *régime* held fast for some years as a normal one; and the dividend has fallen to £4 4s. per cent., with a heavier liability attached in respect of income-tax. Nevertheless, the attendance of proprietors at the meeting was moderate; and we cannot remember a meeting at which an increase of dividend fell due owing to a price reduction when the enthusiasm equalled that (in the presence of the drop in dividend) which punctuated on this occasion the speech and the explanations of the Governor (Sir Corbet Woodall, D.Sc.), and which gave such a pronounced tone of sincerity to the vote of thanks to the Board, officers, and employees. What rules to-day cannot be avoided; and the proprietors know that sacrifice has to be made on every side, and the better the heart with which it is made, the more each one does his or her part to reduce the weight of the burden, the better for all.

It is no use looking at the position with a heavy heart. The more cheerful we are, the more spirit that is displayed, the more matters are looked fairly and squarely in the face, the more we work to crush opposing forces and to hasten the day of freedom from the terrible world conflict, the better. The Governor did not deal with the difficulties as though a heavy burden was upon him. He faced these difficulties; he drew them out in all their nakedness; and he dismissed them by saying that what has happened is "the fortune of "war." Instancing this are his remarks as to coal:

> Had the contracts been duly fulfilled, the small increase in the price of gas would have carried us through; but this was not to be. Deliveries fell more and more into arrear; so, powerless to obtain our due supplies, we were constrained to replenish our vanishing stocks by purchasing such coal as we could at extravagant prices, with freights conforming. . . . What happened was the fortune of war. We discovered that it was impossible to carry on business upon ordinary lines, trusting to the making of contracts at the usual time. In March, the outlook had grown very black. Our stocks of coal were reduced to a few days' supply.

Then followed an explanation as to what has been done to improve transport and other conditions. But the above few quoted lines tell us little of the weight of responsibility and anxiety, and of the plotting and planning to secure a huge area of London in the matter of gas supply, and the Company against having any interruption in the discharge of their obligations. The strain was great. The proprietors realized that no human agency could have done more for the vast organization in which they are partners; and that the issue is a real triumph for the Governor, Board, and officers.

In some other industries, there are just now no dividends for the shareholders; and in some there are larger dividends. But the system of gas trading has been so built-up and so ordered that even in times barren almost of favourable condition, a dividend can be earned, and, where there is co-partnership, something too for the employee partners, in addition to the dividends on their accumulations of capital. The Gas Light Company have earned the dividend they are allowed to declare at the current price of gas; and they are carrying forward a larger balance than was brought into the past half year. This is politic, seeing that the Company depend so much upon this balance for working capital. But there is one thing that should be impressed upon the public, and it is that any increase of the carry-forward, in the case of sliding-scale co-partnership concerns, is the product not of an increase in the price of gas only, but of the reduction of dividend and of the profit portion of the employee co-partners. The increase of the balance is a safeguard; and, with it before him, Sir Corbet entertains the hope that "the present price of gas may not continue neces-"sary for any long period." This is satisfactory; but it may be accepted as a certainty that the Board will not take any definite step in the matter of a reduction until they are absolutely assured that they will not have to retrace it. When the price was raised to the requirement under war conditions, the "fundamental data" available were not sufficient to enable an exact calculation of the position. Now so far as it is possible to presage, the worst conditions are known, and the affairs of the industry have settled down upon a war basis, which enables a better estimate to be made—thanks in part to what the Government have done (due largely to the initiative and perseverance of the gas industry) in the matters of coal prices and exports. In making reductions, however, it will be very necessary to be circumspect in relation to the future. In gauging prospects and a safe margin in the shape of a carry-forward, it must not, for instance, be forgotten that, at the close of the war, gas undertakings will be variously affected. In the districts of some, the industries will be very busy; in the districts of others, there may be a long period of flatness. All will be striving for recuperation. But employment will vary with districts; and working-class patronage will rise and fall accordingly, and that is a patronage that is of vital importance to the gas industry. Post-war conditions in this respect are more uncertain than are the conditions of the present, now that they are fairly well settled, though everything that a gas undertaking requires is dearer to-day than before the war.

Among the salient items in the Governor's speech was the estimate he made as to the increase in working expenses represented by the standard figure, under the Coal Price Limitation Act, of 4s. per ton upon the pithead prices of 1913-14. It means an increased working expense to the Company of no less than £350,000 a year. This is a sum which strikes home with considerable force; but it has the satisfaction about it of showing clearly where the Company stand, and so enables estimates to be framed with greater precision. Then the Coal Exports Committee may take it as a testimony to the value of their work in protecting this country in respect of coal, that the Gas Light Company can now say that their stocks have gained a bulk which gives confidence in respect of next winter, providing the intervening months continue to yield their proportion of supplies. Residuals have improved, and are improving, in market value—coke especially. Whether the price of coke will be affected by the accumulating stocks of coal cannot be said. But it may be taken for granted that the Coal Price Limitation Act has put upon coal a war price to which the coalowners will work; and this fact may be accepted as favourable to the continuance of good prices for coke. We hold for the time the markets abroad for sulphate of ammonia; and the best policy is to see we get well established in them. Tar is also in better case. Supplementing these facts is the one that sales of gas have, subject to weather conditions, reached what may be taken as the full extent of backward move (where such has obtained) so far as any war conditions affect them. In view of these conditions, gas managements can look forward, while keeping strict watch and ward over affairs so as not to be caught napping, to a more composed state so far as their immediate business is concerned. This is one of the impressions gained at the meetings of the Gas Light and Coke and other companies.

The Burden of Coal and Freightage.

Coals and freights are the uncompromising causes of the considerable change that has come over the face of the accounts of the South Metropolitan Gas Company during the past half year; and these causes must be blamed wholly for the increase in the price of gas, the lower rate of dividend, and the smaller participation (a reduction of £11,029 for the year) in the profits of the employee co-partners. Against the reduction to the last-named must, however, be set a more than counterbalancing amount distributed in war bonus and contributed to the war fund (£17,617), and £4000 extra paid over to the superannuation, sick, and accident funds. "Wholly" is a term requiring explanation. The gas business, owing to the lighting restrictions, has been materially reduced; but it is unnecessary to look back far to find the June half year when the gas business was no larger than it was in the past six months, when the price of gas was only 2s. 2d. per 1000 cubic feet (instead of 2s. 4d. in the first three months and 2s. 10d. in the second), when the dividend was at the rate of £5 9s. 4d. per cent. per annum (instead of at the rate of £4 8s. per cent.), and when the employee co-partners were enjoying the maximum attained payment under the beneficial co-partnership scheme. These statements brook no contradiction; for the facts are matters of recorded history. Therefore the term "wholly" is justified. The reduction in the volume of gas business is, of course, temporary; the scope for business remains unaffected—in fact, the data supplied in the past half-year's accounts show quite good progress in the outlets for consumption. This is promising for the future. But it is very clear that the Directors in assessing the amount by which the price of gas would have to be increased finely calculated the minimum; for, with 2d. increase in the first quarter and 6d. additional in the second quarter, and with the payment for dividend reduced by £1 1s. 4d. per annum, there will only be an increase of £3589 in the amount to be carried forward. When, however, it is seen that the additional net cost of coal in the half year, compared with the first half of 1914, was £112,456, and that the total increase in the receipts for gas was £66,680, it is fortunate for the consumers and the proprietors that the repairs and maintenance of works were reduced by £23,944, and the distribution expenses (there were considerably lessened charges all through for repairs, maintenance, and renewals) were diminished by £52,228. These figures are an index to the wisdom of the Directors in favourable pre-war years.

This being purely a coal gas company (without carburetted water-gas plant), the experiences of the concern in these times are interesting to bring into comparison with other undertakings employing carburetted water gas, and especially as the Company have not been, until now, in possession of steamers of their own for the transport of coal. To make 6,936,706,000 cubic feet of gas in the half year, 569,539 tons of coal were used. This is only a reduction of 3617 tons on the corresponding half of 1914, when 213,925,000 cubic feet more gas were made. There would have been a larger reduction in the tonnage if the make of gas per ton had been the same as in the June half of last year. In that period, the production per ton was 12,476 cubic feet; last half year it was 12,179 cubic feet—a falling-off of 297 cubic feet per ton. In the second half of last year, the make was 12,614 cubic feet. It may be taken for granted that the decrease in the production per ton was due not to lax working, but to the quality of the coal delivered to the Company. At any rate, we shall think so, unless the Chairman (Mr. Charles Carpenter, D.Sc.) puts forward a fresh reason at the meeting of the proprietors to-morrow. In justice to the officers and men, the matter should be explained, as there has never been a half year when, on economic grounds, there was greater call for a high gas make per ton of coal. Although the quantity of coal carbonized was 3617 tons less, the cost was £592,260, or no less than £155,990 more than in the first half of 1914. A fortunate thing is that residuals, in yielding £323,315 in the six months, contributed more by £43,534 than in the June half of last year. This being so, the net cost of coal last half year was £268,945, compared with £156,489, or £112,456 more. In other words, the expenditure on coal was upwards of two-thirds higher than in the first half of 1914, regarding which period the Directors a year ago said "the high cost of coal and its freight has "been the cause of the deficiency"—a deficiency of £37,922 in the earnings then required to pay the dividend. In that half year, the cost of coal was 1s. 2·64d. per 1000 cubic feet made, as against 1s. 8·49d. in the past half year, or 5·85d. more. The net cost of coal (deducting residuals) was no less than 9·3d. per 1000 cubic feet of gas made last half year, compared with 5·25d. in the June six months of last year, or 4·05d. more. In considering this last figure in relation to the increase in the price of gas, there must not be forgotten the deficiency of a year ago, the reduction of the gas business last half year, the extra demands upon the revenue of the Company, and the fact that, though a smaller business was done, many of the items of expenditure remain practically the same as formerly, and therefore, in view of the lessened business, they represent a higher charge per 1000 cubic feet of gas sold.

It would be interesting to know how much of the additional cost of the coal delivered last half year was due to coal and how much to freight. Say the Directors: "This "result is entirely accounted for by the extraordinary prices "charged for coal and for its freightage to London; some "of these being nearly treble those paid in recent years." They also refer, as being significant, to the fact that the Government are at last applying to coal suppliers the same principles which have been in operation for forty years in regard to gas suppliers—viz., parliamentary regulation of the prices to be charged. As to the freight problem, this can be solved—by large companies using seaborne coal, but not by the smaller ones—by the purchase of steamers; and the Directors mention that this course has now been adopted. This is a complete change in one part of the administrative policy of the Company; and it is the war that has brought it about, though it is plain from the remark made by the Board twelve months ago as to "coal and its freight," that the question of the vagaries of rates of freight is no new one. But the experiences of the past six months have proved the climax, and the turning-point; and henceforward the Company will keep themselves free from the disturbing influences of market rates for freight from the North. Whether the experiences with coal—the price and the trouble for a time of securing deliveries—have produced more benevolent thoughts in the direction of carburetted water-gas plant, so as to have "two strings to their bow," is a matter about which the Directors do not give any indication. But this would be opposed to the policy of standardizing the consumers' lighting burners, and of maintaining uniformity of gas composition. There were times during the half year, when the Chairman and Directors and the officers were under a heavy cloud of anxiety regarding coal deliveries. It was stated, in the House of Commons just recently, by Mr. Russell Rea, M.P., the Chairman of the Coal Exports Regulation Committee, that he "believed at one period the "South Metropolitan Gas Company were within eleven "days of stoppage"—had further deliveries not been obtainable. The total figures in the accounts do not tell of the degree of anxiety that was felt. But for what they do show they may be quoted. The quantity of coal received during the half year was 534,331 tons, which was short of the quantity carbonized by 35,208 tons. The quantity in store at June 30 was 153,498 tons, or 36,339 tons less than on Dec. 31 last, and 27,558 tons less than at June 30, 1914.

It is gratifying to observe that the consumption of gas for the half year shows a decrease of only 3·73 per cent., owing to the enforced reduction of outside lighting. More especially is this satisfactory seeing that the corresponding half of 1914 gave an increase of 2·29 per cent. upon the first half of 1913, and that the second half of 1914 (embracing the first five months of war conditions) showed a decline of 4·29 per cent. The actual quantity of gas sold last half year was 6,626,723,000 cubic feet, or a reduction of 257,105,000 cubic feet, of which private business accounted for 195,754,000 cubic feet, and public lighting 61,351,000 cubic feet. With all this reduction, the sales last half year were only 102,538,000 feet behind those for the June half of 1913; so that, as before said, steps would not have to be retraced far to find the time when the Company's gas business was only of the same magnitude as last half year. It has been mentioned that in the first three months of the past half year, the price of gas was 2s. 4d. (as compared with 2s. 2d.) and in the second three months 2s. 10d.—the latter being the lighter gas-consuming period, so that the higher price did not really affect the heaviest quarter. The total receipts for gas under these conditions amounted to £800,705, or £66,680 more for the lessened sale than in the first half of 1914—this figure being arrived at by private consumption contributing £71,467 more and public lighting £4787 less, owing to the necessity for doing as much as possible to obliterate London at night time. Rents of meters and stoves and the item of gas-fittings contributed £130,277 to the revenue, or £3269 less—this being entirely due to gas-fittings, which exhibited a reduction of £3927, while meters gave £650 more, and stoves what we should think is the record minimum increase—£8. But the expansion of the area of business is seen by the facts that the total of 372,043 ordinary and prepayment meters is an increase of nearly 4000; the 85,320 ordinary stoves, an increase of 1708; the 231,710 slot stoves, an increase of 5284; and the 50,650 gas-fires, an increase of 5248. Residuals, as previously stated, produced £323,315, or £43,534 more than in the corresponding period of 1914—thanks largely to "the increased value of fuel, and the activity in "the chemical industry." Of coke 284,880 tons were sold, contrasted with 211,733 tons; and the receipts were respectively £202,691 and £150,249, or £52,442 more. There were in stock at the end of June only 24,209 tons, as against 105,746 tons at the same date last year. Breeze, in producing £8829, contributed £259 more to revenue; while tar and tar products (we anticipate largely owing to pitch) gave £50,304, or £3568 less, and sulphate of ammonia £61,489, or £5600 less. The final result is that, including rents and transfer fees, the income of the half year amounted to £1,255,838, or an increase of £107,026, while the total expenditure was £1,066,698, or £90,855 more. The difference between the increased income and the increased expenditure being £16,171, this is the sum by which the balance (£189,140) transferred to net revenue account is higher than a year ago, when there was the £37,922 shortage in the earnings required to pay the dividend. The present carry forward will, as already said, enable the Board to meet their reduced obligations, and raise the small amount brought forward into the half year by £3589.

From the front of the report and accounts, we miss the name of the Chief Engineer; there is not a word of reference to the retirement of Mr. W. Doig Gibb in the report; and no information is given as to the cause or causes of the delay in filling the vacancy. Another change noticed is that Mr. Frank Bush has retired from the Deputy Chairmanship to the position of an ordinary Director. He has only held the more elevated office rather more than twelve months—from the time that Mr. John Mews quitted the office for an ordinary directorial chair. The new Deputy-Chairman is Mr. Kenneth P. Hawksley. These are matters upon which the Chairman is sure to speak at the meeting to-morrow.

Market Freights and Actual Cost.

Shipowners who have hitherto done a considerable coal-carrying business from the North for the three London Gas Companies—even for those who, possessing ships of their own, needed help to meet the balance of requirements over and above their own carrying capacity—may henceforth consider (unless through unforeseen circumstances temporary assistance is desired) their accounts closed with these concerns. The experiences of the so-called market rates for freights last winter, which touched the peak at 17s. 6d. per ton, and for some time moved fitfully between 10s. 6d. and 13s. 6d. per ton, and now seem to be settled at about 150 per cent. higher than normal pre-war rates—that is to say, at from 7s. to 7s. 6d. per ton, compared with about 3s. before the war—have caused the two Companies who already owned boats (the Gaslight and the Commercial) to further protect themselves and their consumers by becoming owners of additional ones, and the South Metropolitan Company, having had sufficient of the uncertainties of the market, have also now become owners, and so have secured themselves against the profit-grabbing that has been going on in shipping circles during the war. The experiences that the Gaslight and the Commercial Companies have had, as to the cost of running their own boats under war conditions, are extremely interesting, and are proof that the trading shipowners have been making full use of the war, and have been unduly magnifying the influences of current conditions in the framing of excuses for the high freights that they have been, and are, charging.

The boats that have been purchased by the Gaslight Company and the Commercial Gas Company having been bought at the present time, were not cheap as prices usually go—in fact, the prices that had perforce to be paid were high. But the figures given by Sir Corbet Woodall at the Gaslight meeting on Friday, and by Mr. W. G. Bradshaw at the Commercial meeting the day before, show that—though running has been expensive owing to the delays caused by Admiralty restrictions, "lights out" at night time, higher wages through risks of the North Sea, and so forth—the new purchases have been excellent investments, as prior experience indicated they would be. Sir Corbet stated that, with all the disturbance of ordinary conditions, and including interest and depreciation, the cost of bringing coal from the North by the Gaslight Company's own ships had only ranged from 4s. 4d. to 3s. 2d. per ton. Compare these figures with the extortionate prices that have been described as "market rates" for freight. Mr. Bradshaw, too, pointed out that, though the Commercial Company's boats were not running, and could not run, with the efficiency and economy obtaining in normal times, the cost of freight in their case had only gone up by an average of 1s. 4d. per ton, compared with the figures for the first half of 1914. This 1s. 4d. included a steamer hired at market rates (presumably before the Company purchased an additional one) for the purpose of improving stocks, as well as the double rates of pay the seamen and firemen on the Company's ships are receiving. These actual costs indicate how fair was the offer of the gas companies to the shipowners to increase the ordinary contract rates up to 5s. per ton. All the experience of the gas companies running their own boats shows that at that price the shipowners would have done remarkably well. A fair profit, however, did not suit them; their idea was to make profits in bulk while the war favoured. The three Companies can now entirely or in large measure dispense with their services—perhaps at the moment not "entirely" in the case of the Gaslight and Coke, inasmuch as only the other day their comparatively new ship the "*Fulgens*" was torpedoed without any warning by a German submarine, in pursuance of what Sir Corbet scornfully describes as the "cowardly and contemptible "lines" on which the war is being conducted by Germany. The boat (which, with the cargo, was fully insured) is a serious loss to the Company, as she carried some 200,000 tons of coal annually for them.

One large claim in favour of ship-owning was made by Mr. Bradshaw at the Commercial Company's meeting. The Company are now, under war conditions, selling gas at 2s. 8d. —a rise of 4d.; and this to-day is the lowest price for gas in London proper. The gratifying temporary supremacy of the smallest of the three Companies in the matter of lowness of price of gas, the Chairman puts down to their possession of ships for coal transport, through which they have not been penalized to the same extent as the other Companies by the extraordinary rise in freights from the North. It is pretty certain that private ship owning will grow among gas companies who rely upon seaborne coal supplies. Where there cannot be, through the size of the concern, independent ownership, we see no reason why there should not be joint ownership.

Heat Exchanges in Carbonization.

The gas engineer knows well that in practice he cannot carbonize coal without the expenditure of a substantial quantity of fuel—coke equivalent to 10 per cent. of the weight of coal carbonized would generally be regarded as an ideal of economy in fuel consumption. But he knows also that the greater part, if not the whole, of the heat developed from the coke consumed in the retort-furnaces is frittered away through devious losses, which cannot be avoided, or even appreciably reduced, without incurring expenditure on plant which would be out of all proportion to the value of the coke saved. The heat of the fuel expended in carbonization is not restored in the products, the whole of which have not a greater heating value than the coal from which they were obtained. But, on the other hand, their total heating value approaches so nearly to that of the original coal that it has not yet been found possible to say definitely whether carbonization involves the evolution or absorption of heat by the material as it is converted from coal to coke, gas, tar, water, &c.

Professor John W. Cobb and Mr. Harold Hollings, in a paper which is published in the current number of the "Journal of the Chemical Society," and of which a digest appears on another page of to day's "JOURNAL," speak of the "current" conception of coal distillation as a process in which heat is evolved. The evidence in favour of this conception is, they admit, inconclusive; and they therefore have set out afresh to investigate the question *ab initio.* The more important technical results hitherto obtained by them were all included in the lengthy report which they presented at the general meeting of the Institution of Gas Engineers last year. They have since extended their investigations on the same lines to materials akin to bituminous coal, with a view to throwing light on the effect from the thermal standpoint of the several elements—in the broad sense—of that widely varying product of Nature. It does not appear that they are yet in a position to set a value on the net thermal result of the carbonization process as applied to gas coal, or even to say definitely whether it is positive or negative.

They have, however, succeeded in showing that, at certain temperatures, reactions by which heat is evolved preponderate over reactions in which heat is absorbed, while at other temperatures the reverse is the case. Generally speaking, coals which approach in composition most nearly to cellulose and dehydrated cellulose are decomposed to a considerable extent at comparatively low temperatures, and thermal phenomena are marked at these temperatures. On the other hand, anthracite, being farthest removed from cellulose, is comparatively stable at low temperatures, and thermal phenomena begin to have relatively great importance only when high temperatures are reached. The results of the investigations deserve careful study, as it seems to us that they may well have a more direct bearing than Professor Cobb and Mr. Hollings have yet indicated on the determination of the best practical carbonizing conditions for different gas coals. On the other hand, since the observations are admittedly of little value for temperatures below 200° C. (= 392° Fahr.), it appears to us that they are less likely than the authors suggest to throw light on the liability of different coals to heat-up spontaneously in storage. We hope that the investigations may be pursued, as is indeed contemplated, because the results already obtained appear to suggest that deductions of great significance may be made from a rather more extended series of observations.

The Travancore Monazite Sands.

The agitation which, at the beginning of the war, was started by the Volker Lighting Corporation, Limited, and carried on by the "JOURNAL," and then taken up with the proper authorities by representative men of the gas industry, concerning the German control over not only the monazite sands of Brazil, but of the Travancore deposits of Southern India, has borne splendid fruit, as will be seen from a report which appears in another column. The Secretary of State for India deserves the heartiest thanks of the gas industry for what has been done, and for assuring to this country a right to enjoy a product of India without the supply profiting Germany *en route.* The statement to hand is not, in our opinion, altogether to the credit of those who formed the original Travancore Minerals Company. The concession was initially granted to the London Cosmopolitan Mining Company; and the right to transfer it was limited by the condition that the transfer was only to be made to a *bonâ fide* British concern. But, notwithstanding this stipulation, what really happened? In the subsequent forming of the Travancore Minerals Company, the Cosmopolitan Company and the General Electric Company were concerned; but the capital that was supposed to have been subscribed by the General Electric Company was, the report states, "held in trust for the Deutsche Gasglühlicht Gesellschaft—or Auer Company—of Berlin, and not on account of the General Electric Company."

A Supply Assured.

This did not conform with the condition attaching to the concession regarding a *bonâ fide* British concern—it appears, in fact, to be a direct evasion of it, and quite of a piece with German finesse in getting control of trade. It was known that the Berlin Auer Company had been receiving the output of the Travancore Company; but we were assured by a letter from the Travancore Minerals Company, which was published in our issue for Sept. 1 last (p. 521), that the Company was a British one, and that it had made a "contract for the whole of its output with the only firm in Europe capable of taking such an output." In the light of what now transpires, this letter is of interest in more ways than one. However, the Secretary of State for India has seen to it that in future the concession is so worked as to assure that the Company "will be ready at all times to sell monazite sand direct, and at a fair price, to *bonâ fide* British firms, without giving preference to large purchasers." The new conditions under which the Company will now be operated are fully set out on p. 283; and a guarantee that there will be compliance with them is given by the fact that the Secretary of State for India has power to nominate one Director, who is to be Chairman if so directed. The first Chairman and Director so nominated is Sir John Hewett; and he has already entered upon his duties. Subjoined to this statement is another announcing the formation of a new Company for working the Travancore monazite sands; and in this Messrs. Hopkin and Williams, Limited, is concerned—a firm of manufacturing chemists who have previously been engaged in the production of thorium nitrate. There is gratification in learning that henceforth this country will not be the dependents of Germany for the chief essential in mantle making; and we hope home gas undertakings and mantle dealers will now give, by full patronage, every encouragement to the mantle makers in this country.

Gas-Works and Munitions Manufacture.

In unity, strength; and in co-operative work increased production. At most of the gas company meetings so far held, the chairmen have been able to point to the fact that the works are making good contribution to the supply of the ingredients necessary for the manufacture of explosives; and that, at the larger works, shops and machine tools have been placed at the disposal of the Munitions Committee, and in cases the making of shells or parts of shells has been commenced. The mechanics are entering on the work with enthusiasm; and in some works members of the clerical, collecting, and sales staffs are willing learners of the way to handle tools, and are spending hours of their own time each week making themselves proficient for giving relief at the lathe, acting as handy men to the expert workman, or taking up any other task which constitutes a contribution to the strength of the country in the great work of securing victory. The industry too is doing a no small part in finding the funds which the war demands. In the domestic part of the history of the war, the gas industry ought to find a place.

Value of Coal Storage.

The Brentford Gas Company, as Mr. R. J. Neville Neville, M.P., showed at the meeting last Friday, has done extremely well in the past half year. In no small measure this is attributed to the favourable position of the Company in regard to coal and oil. The Board and their Engineer (Mr. Alex. A. Johnston) believe in carrying good stocks. The beginning of the war found them well provided; and at the end of last half year, they had some 60,000 tons in store, which is about double the quantity that used to be carried a few years ago. Of course, this means a large amount of money. In fact, the value of the coal and oil in stock at the end of June was £73,971, which means much in the financial situation. But, on the other hand, there is a comfortable feeling in having a large stock of raw material at hand; and, when colliery or other labour troubles come, or when freights are high, or other adverse circumstances interrupt the ordinary course of things, the board and engineer enjoy an equanimity while others unfortunately circumstanced are suffering from a load of anxiety, and praying for relief.

Gas Oil Prospects.

In his speech at the meeting of the Tottenham District Light, Heat, and Power Company on Saturday last, Sir Corbet Woodall alluded to this matter. He says there is a serious prospect of shortage in the supply of oil for gas-making purposes due to the Admiralty having commandeered many tank-steamers, and owing to the destructive work of German submarines and mines. There is comparatively little oil in the country; and a serious position is likely to arise unless the Admiralty find it possible to release some of the tank-steamers. The matter, Sir Corbet states, is at the present time receiving the careful consideration of the Board of Admiralty.

Coal Exports and Price Limitation.

No ill-effect has fallen upon this country through the work of the Coal Exports Committee, in controlling supplies to neutral countries. On the contrary, the country has largely benefited by being in a position to get the coal required for current use and for stocking purposes for next winter. We are sure the still tighter grip which, under the Order in Council promulgated last week, the Government are making upon the coal exported to our Allies, will not be to their disadvantage. The Order now permits export to British Possessions and Protectorates; but for coal destined for allied countries, as well as for neutral countries, licences must be obtained from the Coal Exports Regulation Committee. But it may be taken for granted the Committee will not veto any legitimate trade with, and supplies to, our Allies—in fact this point has been officially made plain to avoid misconception. Since the Coal Exports Committee have been at work, there has been a good supply of ships for the coast trade and for transporting coal to our Allies; and the reason is mentioned in the market reports of the "Iron and Coal Trades Review:" "Lately this branch of the market has been well supplied with boats at the northern ports, because vessels coming from the North of Europe were promptly fixed for the coast or French ports if a licence for Norway, Denmark, or Sweden could not be obtained." The present good supply of vessels is a condition that, compared with what obtained when London and the South of England very badly wanted coal from the North, gives colour to the suggestions in articles in our columns [see July 6, p. 12, and July 27, p. 776] that the unusual activity of ships a few months ago to and from Holland, Denmark, Norway, and Sweden indicated the flowing of coal supplies to Germany through those countries. Confirmation springs from all sides. Concerning the Price of Coal (Limitation) Act, we have this week reproduced the full text of the measure, showing the various insertions and amendments made.

The "Relatively Small Number" Win.

In our last reference to the South Suburban meter-rent scheme—on July 20 (p. 125)—it was stated that the Directors of the Company had announced, through the Secretary (Mr. Wilfrid Wastell) that they had determined to withdraw their objectionable circular, which in the South Suburban area was provoking a swelling agitation—not because of the fact that the doubling of the meter-rent charge made an enormous difference, but because of the proposal to produce a meter-rent economy for the West Kent and Bromley gas consumers, by a one hundred per cent. interference with the meter-rent condition which had existed in the South Suburban area for generations! Upon the withdrawal of the circular, the agitation subsided. Now Mr. Wastell has sent round another circular in which, by desire of the Directors, he conveys their "thanks to the great number of consumers who, by signing the agreement, have recognized the fairness of the proposed advance on the present charge for meter-rent." The circular adds: "A relatively small number of consumers have, however, objected; and the Directors do not now propose to make the change." From local channels of information, it is known that a number of those in the old South Suburban district who signed the circular without troubling about fairness or otherwise began to recognize the unfairness of it after their attention was directed to what the proposal actually meant. It is a pity, however, that a "great number" of benevolent gas consumers who saw the fairness of doubling their own meter-rent in order that the West Kent and Bromley consumers might have relief should be deprived by the Directors of the power of putting their good intentions into practice, and that the "relatively small number" of consumers who were callous to the fairness of the proposal and rebelled against it, should have been allowed to be the victors. The second paragraph of the circular is the best possible comment on the first one. The circular would not have raised so much as a smile had the words "great number of" been omitted from the first paragraph, and "relatively small" from the second one.

The Retrospective Clause.

In an editorial article on the Coal Prices (Regulation) Act, the "Iron and Coal Trades Review" says it fears that the retrospective clause "will not be very cordially received in coal-mining circles outside the House of Commons; for, if there was to be any change at all, what was really wanted to be just was a period of six months after the Act came into operation during which existing prices should hold good." We do not doubt for one moment that the clause has not been "cordially received" in coal-mining circles; we believe that the Act from its first to its last letter is not very cordially welcomed by coalowners, except the very few who are not out for making a large profit per ton through the exigent circumstances of war time. The singular thing about the passing of this measure has been the little public resistance there has been to it from the coalowners; and the "little" has been of a weakly nature. The fact speaks volumes. The Act is in effect an accusation against some, though not all, of the coalowners; and mistrust gave it birth. Its existence in these times is really worse in respect of what it attests than its actual operation. Our coal contemporary speaks of being "just." Of course, it is right that the Legislature should be just even to any colliery owners who may not have had much care to be just to their native land in the hours of extremity. But justice has, in our view, been abundantly served by the prescription of three months during which the contract prices above the 4s. excess over 1913-14 prices shall be preserved to the coalowner; a six months' period would be worse than useless to the purchaser with contracts at excessive prices. And it does not require a coalowner to see the reason why.

Profits on Gas Supply.

Though it was claimed by the Chairman of the Gas Committee, when moving the adoption of the minutes at last week's meeting of the Belfast Corporation, that it has always been the policy of the Committee to supply gas at the lowest possible rate, it would seem, from a summary accompanying the Committee's report, that this remark invites something in the shape of qualification. For the summary shows the allocation of profits during the forty years that have elapsed since the works were acquired by the Corporation. In round figures, of the net profits £980,000 has been spent in connection with the gas undertaking—that is to say, for the direct benefit of those who have provided the money. But at the same time, payments to the City Council have been made to the really respectable total of £393,000—including £187,000 for the general purposes fund in aid of the rates, and £146,000 for dividends and sinking funds in connection with the new City Hall. Among several Committees who have also shared in the good fortune of the gas undertaking, the Electric Committee are down for £40,000. The £393,000 averages about £10,000 a year over the forty years, as a return to the ratepayers; and whether or not it represents a policy which is the best and fairest in the interests of all concerned, it obviously shows that it cannot always, if ever, have been the policy of the Committee to supply gas at the lowest possible rate. As to the justice of the method of securing a more or less artificial lowering of the rates at the expense of the consumers of gas, the views expressed by councillors are as divergent as ever. One notices that in the course of a debate in the Stockport Town Council, a member remarked that Manchester got £50,000 a year from the gas undertaking in relief of the rates, and that "it would be a sorry day for Manchester if ever they stopped this." The gas consumers, at any rate, would probably find themselves possessed of sufficient fortitude to enable them to face the "catastrophe" without any flinching. Another councillor at Stockport urged that if the undertaking were worked on proper lines the surplus revenue received from year to year, instead of being applied to the reduction of the rates, should go to the purchase of any new plant required. It was, he said, an injustice to the consumers of gas that they should be saddled with such a continual increase of borrowed money; and he was glad to see that the Government had refused to allow the Committee to borrow further money for new plant. The Salford Gas Committee, on the other hand—as well as one of the members of the Stockport Town Council—urge that the installation of gas appliances is being seriously interfered with, as the Local Government Board have, for the present, prohibited the borrowing of any further money for such purposes.

Examinations and the War.

An article which is of the greatest possible importance to large numbers of young men who, without thought for themselves or the manner in which their action might influence their future careers, came forward at their country's call, appears in the current number of "Engineering." It is a well-written and a well-reasoned plea that, "after a man has played his part in the greatest tragedy the world has ever seen in its thousands of years of toil and tumult," he shall not find his future career menaced through having done so. It is pointed out by the writer that great numbers of the young men holding commissions in the army were last year preparing for examinations of various kinds, and that few will again be able to take up the threads of their studies when peace is proclaimed—first and foremost because the men will be at any rate a couple of years older than when they broke them off, but also because "they will have been face to face with actualities of most serious import, and will never again be able to resume the docile and attentive attitude which befits the student." Still, in many branches of work degrees or diplomas are, of course, almost a *sine qua non*, if a man is to get to the top; and it is this reflection which leads our contemporary to earnestly express the hope that, before peace is declared, "the academic and professional bodies of this country will come to some definite decision as to what is to be their attitude to the young men who have interrupted their careers at the call of the country, and are faced with the possibility of them being irretrievably broken." There will be general agreement with the view that it would be an outrageous thing if in the future the prizes of life were allotted to those who had stayed at home, while the men who had risked their lives were made to suffer from a permanent handicap from which they could never escape. The author of the article says that what the Councils of the Engineering Institutions have now to consider is how far their examinations can be temporarily relaxed so as to do justice both to the candidates and the public; and the suggestion made by the writer is that the kind of knowledge which can be fairly expected at examinations of men who have broken off their studies for the war is that which the ordinary candidate retains three years after obtaining his diploma. The proposal is merely put forward tentatively; but a compromise on these or some other lines will no doubt be arrived at.

An Ancient Proposal Revived.

The "Building News," in its "Currente Calamo" columns, comments upon the position of the Gaslight and Coke Company, in respect of their present dividends and the market prices of their stocks. But it does not say anything about these conditions being of a temporary nature, owing to the war and the operation of the sliding-scale. Our contemporary evidently thinks things are in a bad way with the Gaslight and Coke Company working under the modern system; for it makes the grey-with-age suggestion: "Why not pipe-line gas to London from the pit mouth, and sell a lower grade gas for heating at (say) 1s. per 1000 cubic feet, and leave lighting to the electric undertakings. We should all use it then, and London would be smokeless." By the time that the pipe-lines were constructed, with the huge carbonizing plants erected at the pits' mouths, and compressors for putting the gas under pressure, when the waste of gas was taken into account, and the distribution expenses on the coke and the other secondary products which are required in every locality were paid, it would probably be found that the same thing applies today that has applied for decades since the proposal had original birth—that there would be no advantage in the new system for consumers over and above what prevails in normal times now. Besides which there would be a great destruction of capital in abandoning existing works. The "Building News" is evidently not aware that there are towns in which in normal times gas is sold round about 1s. per 1000 cubic feet. But coal, labour, transport, and the heavy capital outlay of a past day, conspire to prevent, despite new economic conditions in manufacture, a more rapid approach to this figure by other towns. Still, with gas at ordinary prices, more than 3 million gas-cookers are in use in the United Kingdom; and gas heating is progressing by leaps and bounds.

Production of Gas in Germany in 1914.—A circular-letter of inquiry issued by the Central Gas Publicity Bureau in Berlin to gas-works in Germany has been answered by 733 works, which have in previous years replied to a similar inquiry as to their production of gas in the past year. In some cases the figures refer to the calendar year, and in others to twelve months ending March 31. Consequently those for the last year cover in some cases a longer period of war conditions than in others. The total production of the 733 works in 1914 (or 1914-15) was 2,208,196,500 cubic metres (about 77,982,460,000 cubic feet), which is a decrease of 3·7 per cent. on the production of the same works in the previous year. On the other hand, that year showed an increase of 5·3 per cent. over 1912.

CITY AND GUILDS EXAMINATIONS.

The Prize Winners for 1915.

In the "Journal" for the 6th ult. (p. 18), the list was given of the candidates who passed the last examinations in "Gas Engineering" and "Gas Supply" in the Department of Technology at the City and Guilds of London Institute; and on another page of to-day's issue will be found a similar list in the newly inaugurated examinations in "Gas-Fitting." We have now received a list of the prize winners in the subjects named, as well as in those of "Coal-Tar Distillation" and "Coal-Tar Colouring Matters." The following are the names of the successful ones; the centres at which they were examined being put in parentheses—no place of residence being given.

Gas Engineering.

Brown, Herbert H. (Southampton): First prize, Grade I., £2 and bronze medal.

Clarke, Claude H. (Regent Street Polytechnic, London): Third prize (equal), Grade I., bronze medal.

Hunter, F. S. (Liverpool Municipal Technical School): Third prize (equal), Grade I., bronze medal.

Jones, Edgar (Derby): Second prize, Grade I., £1 10s. and bronze medal.

Thomas, Leonard H. (Birmingham Municipal Technical School): First prize, Final, £3 and silver medal.

Gas Supply.

Cæsar, J. E. V. (Canterbury): First prize, Grade I., £2 and bronze medal.

Haynes, J. T. (Liverpool Municipal Technical School): First prize, Final, £3 and silver medal.

Hunter, F. S. (Liverpool Municipal Technical School): Third prize, Grade I., bronze medal.

Weekes, R. C. (Devonport): Second prize, Grade I., £1 10s. and bronze medal.

Gas-Fitting.

Bellamy, F. B. (London County Council): Second prize, Grade II., bronze medal.

Walton, John (Birmingham Municipal Technical School): First prize, Final, silver medal.

Wardle, Thos. J. (Grimsby): First prize, Grade II., bronze medal.

Coal-Tar Distillation.

Bradley, G. W. J. (Salford Royal Technical Institute): Second prize, Grade I., £1 and bronze medal.

Freeborn, Albert (East Ham Technical College): First prize, Final, £2 and silver medal.

Hunter, Harold (East Ham Technical College): First prize, Grade I., £1 10s. and bronze medal.

Young, Roland F. (East Ham Technical College): Third prize, Grade I., bronze medal.

Coal-Tar Colouring Matters.

Payman, W. (Manchester Municipal School of Technology): Third prize, Grade I., bronze medal.

Perkins, Maurice (Bradford Technical College): Second prize, Grade I., £1 and bronze medal.

Rosenbaum, J. L. (Leeds University): First prize, Grade I., £1 10s. and bronze medal.

New Synthetic Coal Gas.

The "American Gas Institute News" publishes the following, which appeared in the "Scientific American Supplement": A new lighting gas has been prepared which is claimed to be much less toxic than water gas or air gas, and yet possessing a calorific value approximating that of coal gas, and, therefore, far greater than that of water gas or air gas. The new gas may be obtained from coal, coke, or from water gas. When coal is used, this is first mixed with lime, and distilled at 900° to 950° C. A current of steam is then introduced over the coke so produced, maintained at 900° to 1000° C. The total yield of gas freed from carbon dioxide is about 64,000 cubic feet from 1 ton (2000 lbs.) of coal. It contains 70 to 78 per cent. of hydrogen, 15 to 20 per cent. of methane, and 5 to 10 per cent. of carbon monoxide. By regulating the reaction, the amount of carbon monoxide may be reduced to practically *nil*. The amount of ammonia recovered as a bye-product is more than four times that obtained from the same coal by the ordinary methods of distillation; and the volume of lighting gas is eight to ten times greater. The whole of the nitrogen present in the coal is converted into ammonia.

PERSONAL.

Mr. G. M. Gill, the Assistant-Engineer of the Commercial Gas Company, has been appointed by the Metropolitan Munitions Committee to be District Manager of the Stepney and Poplar district.

Mr. W. G. Head, the Superintendent of Mains of the South Metropolitan Gas Company, has been appointed by the Metropolitan Munitions Committee to be District Manager for the South-East London district.

Mr. H. M. Thornton, the Managing-Director of the Richmond Gas Stove and Meter Company, Limited, of London and Warrington, has been appointed a co-opted member of the Manchester Air-Pollution Advisory Board—a Sub-Committee of the Sanitary Committee of the Corporation.

On the 5th inst., to mark the severance of Mr. Hugh Uttley's connection with the Rossendale Union Gas Company (Bacup) after 26 years' service in the capacity of meter inspector, he was presented by his colleagues and office staff with his own and their photos arranged in a handsome frame.

After interviewing four candidates, the Ellesmere Port Urban District Council have conferred upon Mr. William A. Nicholas the position of Manager of the gas-works which they are acquiring from the Shropshire Union Railways and Canal Company. Mr. Nicholas is at present in the service of the Company.

Mr. W. G. Wilshaw has recently been appointed Chairman of the Romford Gas and Coke Company, Limited, in succession to the late Mr. Joseph Smith, J.P. Mr. Wilshaw is Chairman and Managing-Director of Messrs. Fletcher, Son, and Fearnall, Limited, one of the largest dry dock proprietors on the Thames. He has been closely associated with the gas industry for nearly fifty years; and for the last twenty-five years has been a member of the Board of the Romford Gas Company.

Among the applicants for the position of Chief Engineer of the South Metropolitan Gas Company, advertised in the "Journal" last April, was Mr. W. B. Leech, the Engineer and Manager of the Leeds Corporation Gas Department. We learn, however, that Mr. Leech has now withdrawn his application, as he felt it was unfair to his Committee to allow the matter to drift on any longer, taking into consideration the amount of re-organization and re-construction work he has on hand at present in connection with the Leeds Gas Department.

It will be with mingled feelings of gratification and regret that members of the gas industry will learn that Dr. W. B. Davidson, of Birmingham, has accepted the offer of a new and very tempting position, as Chemical Engineer to British Dyes, Limited. In his new sphere his extensive gas engineering experience will, of course, be of great value to him; and it may be confidently predicted that he will continue to keep in as close touch as practicable with the industry for which he has done so much good work. Dr. Davidson, who is arranging to leave Birmingham in about a fortnight's time, will be much missed by the Corporation Gas Department there, in the service of which he has spent a considerable number of years—first as Chief Chemist, and since the beginning of 1912 as Engineer of the Nechells Gas-Works.

The invitation for applications for the position of Engineer and Manager to the Romford Gas and Coke Company, Limited, which appears in our advertisement pages to-day, is necessitated by the retirement, primarily through ill-health, of Mr. W. D. Child, who has held the position for nearly forty years. On completion of thirty years' service, in September, 1906, he was presented, as a mark of esteem, with a gold watch, subscribed for by the whole of the staff and employees; and in making the presentation, Mr. J. W. Harvey (the Secretary) remarked that Mr. Child had been a great friend to everyone in the employment of the Company. On leaving school, Mr. Child was articled to his father, head of the firm of Messrs. G. E. Child and Son, who for many years had been established as engineers and contractors at Southwold, giving special attention to gas-works plant. Subsequently he enlarged his experience of the design and manufacture of apparatus, first at Newport (Mon.) and then in London. Since he has been at Romford, the make has risen from 15 million cubic feet per annum to more than ten times this quantity; while the price of 5s. 5d. per 1000 feet has been nearly halved. Mr. Child was elected a member of the British Association of Gas Managers (as the Institution of Gas Engineers then was) in 1874; and he was one of the earliest members of the Southern District Association, of which body he was President in 1887. In 1898, he occupied the Presidential Chair of the Eastern Counties Association. As a mason, he is well known; having been W.M. of the Liberty of Havering Lodge in 1894, and of the Evening Star Lodge in 1901.

In the "Journal" for Dec. 1 last, mention was made of a letter by Mr. Douglas H. Helps, in which the writer stated that the Reading Gas Company had then about fifty of their workmen and staff with the forces. It is gratifying to learn that this number has since been doubled; there being now about a hundred of the Company's employees serving. In the same letter, Mr. Helps wrote that his Junior Assistant, Lieutenant H. M. Brown, was with the Leicestershire Regiment at the front. Some two months ago, Lieutenant Brown was invalided home in order to undergo an operation. This was successfully performed; and he is now serving again.

OBITUARY.

The death is announced of Mr. William Wilson, the Secretary of the Portadown and Banbridge Joint Water Board. He held the positions of Town Clerk and Surveyor of Portadown.

The "Journal für Gasbeleuchtung" of July 24 reports that the death occurred at Dresden on the 7th ult. of Herr E. R. Storl, who had been Manager of the gas and water works of Riesa from 1873 to 1908. In the latter year he retired from work.

Dr. James A. Bennett, the Treasurer of the New York Consolidated Gas Company, died on the 11th ult., in his seventy-third year. In 1864, Mr. Bennett entered the employ of the Manhattan Gaslight Company; and in 1884, when the New York Gas Companies amalgamated, he became manager of a branch office. He was made Secretary of the Consolidated Gas Company in 1901, and Treasurer two years later. He was interested in a number of trading concerns—occupying, among other offices, that of Treasurer of the Astoria Light, Heat, and Power Company.

A well-known consulting electrical engineer has passed away by the death of Mr. Robert Hammond, who died last Thursday at Hampstead, after a short illness. He had been connected with the electric light industry in this country since quite the early days; and he was responsible for a large number of undertakings for the supply of current, and in connection with traction, in the United Kingdom and abroad. He had, of course, a large practice as a parliamentary witness, and in rating appeals and arbitrations. He acted for the London County Council in the matter of their Bulk-Supply Bill of a few years ago, and also as one of the advisers of the Post Office in the matter of the acquisition of the telephones. Mr. Hammond, who was a member of the Institutions of Civil, Electrical, and Mechanical Engineers, was born in 1850; and it was in 1878 that he took up electrical engineering in connection with a business established by him in Middlesbrough and London.

The death occurred last Wednesday, at Nottingham, of Mr. Stephen Moore, who had been formerly for many years Manager of the Corporation water undertaking, and was one of the city's oldest and most esteemed public officials. Originally he was associated with the Water Company, whose rights were acquired by the Municipality in 1879, following the purchase of the gas-works in 1874. As Manager of the Company, to which position he ultimately attained, he was responsible for much valuable service. Mr. Moore terminated his active participation in official work in 1908. One of the principal matters in which he was concerned during his long official career was naturally the transfer of the Company's interests to the Corporation. The late Sir S. G. Johnson, the Town Clerk, had been primarily responsible for the policy which led to the purchase of the gas-works; and in the settlement with the Water Company substantially the same plan was followed in regard to financial details—the purchase being upon the basis of the conversion of the Company's stock into annuities bearing interest at 6½ per cent. the first year, 6¾ per cent. the second year, and 7 per cent. afterwards. The Company were paid a bonus of £20,000. Mr. Moore's services were continued with marked advantage to the city; his official work covering the period of its greatest commercial expansion. The deceased was 77 years of age.

TRAVANCORE MONAZITE SAND DEPOSITS.

Conditions for the Future Working of the Concession.

It will be remembered that, at the time of the outbreak of war, concern was felt in the gas industry on the subject of the maintenance of an adequate supply of incandescent gas-mantles. This alarm has since proved to be groundless—in the first place owing to the fortunate prevision of the Directors of the South Metropolitan Gas Company, in putting in their stores a considerable supply of the essential thorium nitrate. The industry was, however, awakened to the critical position in which it stood, in being so largely dependent upon Germany for the supply of thorium; and attention was drawn to the fact that large deposits in the Travancore State of Southern India were controlled by the Travancore Minerals Company, Limited, the whole of whose output was finding its way, under contract, to a large consumer in Berlin. The steps that have since been taken to ensure supplies of monazite sand from these Indian deposits finding their way to this country are outlined by the following remarks, which were made by Sir John Prescott Hewett, G.C.S.I., C.I.E. (who has been appointed by the Secretary of State for India to be a Director and Chairman of the Travancore Minerals Company), on his taking his seat at the Board meeting last month.

The lease for mining certain deposits of monazite sand in the Travancore State in Southern India was, with the approval of the Government of India and the Secretary of State for India, granted by the Travancore Durbar in May, 1911, to the London Cosmopolitan Mining Company, Limited. The right to transfer this concession was limited by the condition that the transfer could only be made to a *bonâ fide* British concern. In December, 1911, an agreement was entered into between the London Cosmopolitan Mining Company and the General Electric Company to form a British Company to take over and work the lease. The terms of the transfer were that the Cosmopolitan Company received £10,000 in cash and £10,000 in ordinary shares. The

General Electric Company subscribed £20,000 in preference shares to the Travancore Minerals Company, and received, by way of commission, £10,000 in ordinary shares in the Travancore Company. Inquiries instituted after the war began disclosed the fact that the whole of the preference shares and 11,000 of the ordinary shares (1000 of the holding of the Cosmopolitan Company having been transferred since 1911) were held in trust for the Deutsche Gasglühlicht Gesellschaft—or Auer Company—of Berlin, and not on account of the General Electric Company.

After a full consideration of the circumstances, the Secretary of State for India determined that certain conditions, of which the following are the most important, must be enforced in regard to the future working of the concession by the Travancore Minerals Company.

1. Preference shares in future to carry no vote.
2. Ordinary shares to be divided into two classes; the 11,000 shares held for the Auer Company being classed as "A," and the remainder as "B" shares. "A" shares to be entitled to one vote only per two shares.
3. No ordinary shares to be transferred to persons other than natural-born British subjects.
4. All Directors of the Company to be British subjects, and the majority to be British-born subjects. The Secretary of State for India to have the power to nominate one Director, who shall be the Chairman if the Secretary of State so direct.
5. The Directorate to consist in future of seven persons—two elected by holders of "A" shares, and the rest (apart from the Secretary of State's nominee) elected by holders of "B" shares.
6. The Company to give a formal undertaking that it will be ready at all times to sell monazite sand direct, and at a fair price, to *bonâ fide* British firms, without giving preference to large purchasers.

These conditions were duly accepted at the meeting of the shareholders held on June 16, and confirmed by the subsequent meeting held on July 2. And, in pursuance of the fourth of them, I am present at this meeting as the Director and Chairman of the Company nominated by the Secretary of State for India. The business is to constitute the Board by electing six Directors. Of these, two will be elected by the holders of the ordinary "A" shares, and four by the holders of the ordinary "B" shares.

After the Board has been constituted, their first duty will be to give effect to one of the conditions laid down by the Secretary of State, which is of the greatest public importance. The Company have in previous years transferred the whole of their output to a German Company, called the "Germania," under an agreement which has now terminated. The following undertaking has been accepted by the shareholders in respect of future transactions:—

> The Company will be ready at all times to sell monazite sand direct, and at a fair price, to any *bonâ fide* British firm that may desire to purchase the material in reasonable quantities for the purpose of manufacture. The Company further undertake that they will give no preference in the matter of price to any purchaser or purchasers of very large quantities, but that the price per ton for all purchases of lots of 10 tons and upwards shall be the same, free at the mine. The Company clearly understand that if, in the opinion of the Secretary of State for India, the control of the Company has passed at any time out of British hands, or if, in the Secretary of State's opinion, there is grave danger at any time of British control being lost or jeopardized, or in the event of any breach of this undertaking, power is reserved to cancel the concession.
>
> The Company hereby further undertake that they will at all times hold all the books of the Company open to the inspection of the Secretary of State for India at the registered offices of the Company.

This undertaking will be brought into effect by its being signed and sealed at a meeting of the Board to be held directly after the meeting of the shareholders has completed its business.

The "Chemical Trade Journal" of the 7th inst. reports that a new Company has been floated to work monazite in Travancore State. It is started by Messrs. Hopkin and Williams, Limited, of London. The Secretary of State sanctioned last month the issue to them by the Travancore Government of a lease for twenty years of a plot of 150 acres on a royalty of £3000 a year. An efficient scientific staff has now been organized to work the concern, which comprises Mr. Edmund White, B.Sc., F.I.C., and Mr. E. Malillamoney, B.Sc., A.R.C.S., State Geologist, who relinquishes his appointment with the Travancore Government, and Mr. Ralph Taylor, late of Chisholm Ewart and Co., of Colachel, joins as General Manager. It is hoped to start operations in October next. This is the second venture to work monazite in Travancore—the first one being what is now known as the Travancore Minerals Company.

The American Gas Institute have been awarded the "Grand Prize" for their collective gas exhibit at San Francisco; and Mr. E. G. Cowdery and Mr. E. C. Jones have received Medals of Honour as collaborators in its preparation.

FRENCH GAS PROFESSIONAL SYNDICATE.

Last Year's Work.

It will doubtless be in the recollection of "Journal" readers that there is in operation in France an organization, consisting of gas engineers and managers, entitled the Syndicat Professionnel de l'Industrie du Gaz. It deals with the business side of the industry—leaving manufacturing and constructional matters to be taken up by the Société Technique. It is a kind of French Commercial Gas Association, but with more extended powers than our own Association. There are 147 members, representing gas and electricity works supplying respectively 13,812,499 and 3,763,465 inhabitants. The finances are provided by contributions at the rate of 2 fr. 25 c. per 1000 inhabitants in the case of gas, and 2 fr. 50 c. per 1000 in that of electricity. In the year ended Dec. 31, 1914, the revenue amounted to 40,333 frs. (£1613), and the expenditure to 39,822 frs. (£1593); showing a balance, in round figures, of 500 frs. (£20).

These particulars are obtained from the recently issued report of the annual general meeting of contributors (held during April last under the presidency of M. Henri Marquisan, the General Manager of the Bordeaux Lighting Company), a copy of which has been courteously forwarded to us. It contains a report on the work of the Syndicate in the past year by the Chambre Syndicale, the President of which is M. René Masse, the General Manager of the Société d'Eclairage, Chauffage, et Force Motrice (the Company supplying gas in the suburbs of Paris), whose important work on gas manufacture was reviewed in the "Journal" not long ago. This report goes in great detail into all the matters which engaged attention last year, particularly those relating to keeping up the supply of coal to the gas-works in the area affected by the war and the disposal of the residuals. Acknowledgment is made for much information on these matters obtained from the "Journal." Labour questions (pensions and retiring allowances), legal cases, and the propaganda work of the Chamber are touched upon; the last-named being somewhat hampered by the war. The report occupies more than 36 large pages; and opportunity may be taken to deal more fully with its contents on a future occasion.

M. Marquisan went out of office at the annual meeting, and was succeeded by M. Macaux, Manager of the Compagnie Nouvelle du Gaz de Saint-Etienne (Loire). The late M. Delahaye was the General Secretary of the Syndicate, and testimony is duly borne in the report to the value of his work and to his excellent personal qualities. In order to prevent interruption in the secretarial work, the President of the Société Technique (M. Rouland) authorized their Secretary (M. Bouron) to undertake the duties pending the appointment of a successor to M. Delahaye.

ELECTRICITY SUPPLY MEMORANDA.

Preference under the Rateable Value System.

The "Point-Five" men should really decide definitely whether, under the rateable value system of charging, the fixed sum levied is spread over the whole consumption, or only over the units consumed for lighting purposes, because then the ground would be clear for settling the question as to the system conferring preferential charges for particular services. Mr. Thomas Roles, the Chief Electrical Engineer of Bradford, publicly announces that he has decided the point to his own satisfaction. But in Bradford the electricity supply and the gas supply are under Corporation management; and there is not much chance of electricity consumers in the borough knowing anything about sections 19 and 20 of the Electric Lighting Act, 1882, which prohibit the electricity suppliers from doing business for "corresponding" purposes (which term is defined by the Long Eaton case) at rates which give an undue preference. Mr. Roles is one of the two gentlemen who read a paper on the Point-Five system at the last meeting of the Incorporated Municipal Electrical Association, and got very badly handled in consequence [see "Memoranda," June 29, p. 745]. He has now published his statement of defence, and has not made a very good job of it. In this he says: "In Bradford and Sunderland, the fixed charge arrived at on the rateable value basis has been so calculated that, *plus* a charge of ½d. per unit for current used for lighting purposes as registered by meter, it is on the average equal to the cost of lighting a house moderately well throughout at between 3½d. and 4d. per unit." He proceeds to say that "it follows therefore that, on the average, all units sold for heating and cooking purposes, and any increase of illumination above the ordinary, are obtained by the consumer at a flat-rate of ½d. per unit." This is a very positive statement; and we should like Mr. Roles to tell us, upon that, and with the Long Eaton judgment before him, whether he is prepared to supply units for heating and cooking at a flat-rate of ½d. per unit *without* stipulating that the consumer shall use electricity for lighting, and for it pay a fixed percentage on the rateable value of his house *plus* ½d. per unit. If he is not prepared to do this, then he is giving preferential treatment to the cooking and heating consumers at ½d. per unit whose lighting is paid for at a fixed charge on the rateable value *plus* ½d. per unit. The use of current for cooking and heating is contingent on the payment for lighting under the rateable value system. On the other hand, if Mr. Roles spreads the fixed charge over the whole consumption, as in the case of one of his consumers who gets all his units at an average price under the rateable value system of 0·73d. per unit—units for lighting, for heating, and for cooking—then this man is getting preferential treatment for lighting over the lighting consumer who pays (say) an average of 4d. per unit, and who may be just as good a consumer for lighting purposes. Regarding this particular consumer, let it be said that all consumers on the rateable value system have not the capacity for electricity use that he has. The system is a way of giving preference; and this is easily demonstrable. As we showed when commenting on his paper, Mr. Roles has not himself been very successful in arranging a fixed payment on the rateable value *plus* ½d. per unit system, so that it returns to the undertaking the equivalent for lighting of the previous revenue from lighting on the flat-rate charge. Many of the consumers have largely increased their consumption and for a much smaller payment—the undertaking being thereby deprived of revenue, while turning out more units for the money received, and will have to turn out considerably more still in many cases before recouping the former revenue. Extra current cannot be generated without cost—in the way of fuel, oil, depreciation, and so forth. Concerning water heating, Mr. Roles says there are a number of electric water-heating installations in use which are giving satisfaction, and are working economically. Would he mind saying where these are to be seen, and whether it would be possible to make consumption, time, and capacity tests for comparison with data from modern gas-heated water appliances?

Coal Contracts and Electrical Undertakings. When the gas and electricity supply industries had the joint conference some time ago on the coal question, certain electrical engineers stated that they had no complaint to make regarding their coal deliveries. They were, of course, speaking of their individual experiences, and not for the country generally. Many electrical undertakings had been almost in a state of exhaustion, and close to collapse, owing to the condition of their fuel supplies, and not a few were mightily glad a good fuel for steam-boilers could be obtained from the local gas-works. To those electrical undertakings that were almost *in extremis* for fuel, the engineers who were well-favoured in this respect did not do any good service by brightening the aspect of conditions by relating their own individual experiences, which were of a contrary order. The testimony of Mr. A. E. Cramb, the Borough Electrical Engineer of Croydon, may be given as representing for a suburban concern the contrary condition of things. He says that a contract for sufficient coal to carry through to the end of the financial year, at 16s. 3d. per ton, was suspended in the autumn, due to restrictions of shipping in Scotland; and it was therefore necessary to purchase supplies when and where available at ever-increasing prices. Note should be made of this by our gas-engineering friends who think the southern gas undertakings were blamable for the rise in the price of coal in the early part of the year owing to their inability to get sufficient supplies to satisfy their needs other than in the open market. Mr. Cramb proceeds to remark that generally, contracts for Midland coals were executed so that Croydon suffered relatively more than many electrical undertakings during this period from increased prices of coal. In 1913-14, 21,565 tons of coal were used, at an average price of 17s. 11d. per ton. In 1914-15, 21,078 tons were used, at an average price of 17s. 8d. per ton. Now he estimates the average price will be more than 25s. per ton—possibly 26s. a ton for the present year. Even the former figure means an increased burden on the undertaking of approximately £9000 to £10,000. Put the electrical statements at the conference against this one, and against the appointment of the Coal Exports Regulation Committee and the passing of the Coal Prices Regulation Act, and then ask how far the statements represented general experience.

The Price and the Man. There has frequently been complaint in the electrical papers regarding the parsimony of municipal electricity departments in the payment of members of their staffs. The practice of under-estimating the value of services, and under-paying for them, appears to stubbornly survive, and it will offer a lot of resistance before it resigns itself to final burial. We are reminded of the periodical complaint by an assessment made in "Installation Topics" of the "Electrical Times" of the salary value of a man connected with the outside work of an electrical undertaking, whose services are said to be of a highly valuable order. As mentioned in the "Memoranda" last week, the writer of "Installation Topics" attacked the charges made by electrical contractors for wiring work, which charges, he asserted, did much to damage the progress of the electricity supply business. A correspondent, when referring to this attack, speaks of his experience when a business developer for a municipal electricity undertaking. He found that the local contractors were meritoriously trying to get wiring business independently of the electricity undertaking; but they unmeritoriously valued what they did at a high figure. He started playing off one contractor against another, and so secured what he considered were reasonable prices for consumers. At length, the contractors came to the wise conclusion that this man was doing good work for both them and his department. He urges the appointment of a wide awake canvasser who can keep his chief supplied with all sorts of information as to what is going on in the district, which may be of value to him and the undertaking. The man in view seems to be one who shall not only directly canvas for business, but act as a sort of spy in the area, and be well up in the rules of German espionage. "There are often," says this correspondent, "influences at work in opposition to electrical development that can be discovered and overcome through the efforts of a competent outside representative, whose remuneration should not depend solely upon the number of applications brought in. A corporation official who has the faculty of inspiring confidence among consumers and likely users, and has the supreme gift of tact in dealing with complaints, and settling differences between rival contractors or between individual contractors and the supply department, is a valuable asset, and his services cannot fairly be paid for on a commission basis only." Such a highly accomplished paragon, the correspondent states, there should be no difficulty in securing at a salary of £3 a week or thereabouts, which suggests that brains and ability are very inequitably assessed in the electrical industry, or there is such an unfortunate burdensome supply in the market that, under the operation of the law of supply and demand, a higher rate of pay cannot be commanded.

Value of Personal Contact. Bearing on much the same subject is another note in the same issue of our contemporary. It asserts that, in the electrical industry, sufficient is not made of the value of pressure contact with consumers. Little encouragement is given to consumers to pay visits to the electricity offices to pay their accounts, and, while doing so, to make inspection of the show-rooms. Little is done to create a friendly feeling between suppliers and consumers. Insufficient too is made of personal touch through canvassers. Altogether things seem in a bad way in the matter of developing methods. It is acknowledged that gas is a keen competitor; and that satisfactory progress cannot be made unless there is ceaseless activity. This acknowledgment is something, because at one time the electricity industry was accustomed to speak of the gas industry in much the same way as Germany spoke of the British Fleet. The gas industry was long since condemned by certain feeble-brained members of the electrical industry to speedy dissolution, and final disappearance from the face of the earth. But here it still is; and, like the British Fleet, it is stronger than ever. The note in our contemporary was inspired by a paragraph in the annual report of Mr. R. Ayton, the Borough Electrical Engineer of Winchester, in which he says:

> Heating, I am pleased to say, becomes increasingly popular, and is proving a most remunerative source of supply; cooking has not made during the year the progress I anticipated—this, however, I consider is accounted for by the war, as it has been found that consumers are unwilling to make a radical change of this nature under present circumstances. I feel sure, however, that a greatly increased output in this direction could be obtained by holding a demonstration, such as was suggested about this time last year, in order to bring to the notice of the general public more prominently the various uses to which electricity can be put, or alternatively, by opening a showroom in some central part of the city where the latest appliances could be exhibited and demonstrated. To a large extent the department is handicapped in this direction, as owing to the offices being rather out of the way I find that it is becoming more the rule for consumers to remit their accounts by post, with the result that we lose the advantage of a personal visit which can hardly be made up for by the circulation of publicity literature.

Mr. Ayton is wise. It would be a good thing for the gas industry if there was a little more personal contact; but in some areas, it is a big business to keep in close personal touch with the enormous number of consumers.

Profits on Half-Watts. The makers of the "Mazda" "half-watt" lamps evidently do not want contractors to devote much attention to the sale of the small sizes of these lamps; for they make this announcement in their advertisements: "Do you know that your profit on the sale of *one* 1500-watt Mazda half-watt lamp is equal to your profit on *twelve* 100-watt lamps, or *seventeen* 20-watt lamps, or *twenty-three* 10-watt lamps? Think what this means—one transaction instead of many; greater satisfaction to your customer; more business; more profit for *him* too."

A Gas Manager Appointed Professor at a Dutch University.—The Vice-Director of the Amsterdam Gas-Works, and Manager of the new southern gas-works, Heer C. K. Visser, has just been appointed Professor at the Delft Technical University. The new professor, who is only 37 years old, entered the gas industry about the year 1905, when he was appointed Constructional Engineer for the erection of the new Trekvliet Gas-Works of the Hague Corporation. In 1907, when the new works came into operation he was appointed Vice-Director of the Hague Gas-Works and Manager of the new works. Ten months afterwards, he was appointed Vice-Director in Amsterdam, where he supervised the construction of the new southern gas-works, and afterwards of the smaller northern works. The new professor will deal with the construction of water and sewage works, and with the design and calculations of constructional work.

RECOVERY OF WASTE HEAT ON GAS-WORKS.

Test at a German Gas-Works.

MANAGERS of gas-works have from time to time been upbraided by engineers engaged in other industrial undertakings for allowing large quantities of heat, which might be utilized, to go to waste in various directions on their works. The economists sometimes suggest that they would be prepared to pay a good price for the waste flue gases if the gas-works would undertake to discharge these gases into an insulated conduit leading to an adjacent site, instead of up existing chimney stacks. On this site they would utilize the sensible heat of the flue gases for some industrial purpose which is seldom clearly defined. If the gas manager shows a disposition to discuss such a scheme seriously with his critic, the latter generally withdraws his suggestions with the admission that he had not realized that, so far as the conditions of working allowed, gas-works seemed already to be recovering most of the waste heat which could be utilized with any prospect of economical advantage. Nevertheless, in these days of dear coal it behoves the gas manager to investigate any possible sources of economy of fuel on his works; and on this account some figures taken from a study of the question by Herr Ernst Schmied, the Manager of the Corporation Gas and Water Works of Aschaffenburg, may be of interest.

Herr Schmied's communication, which was presented at the twenty-ninth general meeting of the Bavarian Association of Gas and Water Engineers, has been published in the "Journal für Gasbeleuchtung" of the 12th of June. The author states that waste-heat recovery on the lines discussed by him is being tried experimentally at the Aschaffenburg Gas-Works with the special object of providing high-pressure steam. The gas-works have an annual make of about 70 million cubic feet of gas, which is obtained chiefly from three settings, each of eight vertical retorts, having a productive capacity of nearly 100,000 cubic feet per diem. But there are also three settings, each of eight horizontal carbonizing ovens of the Munich type, which are only used when the demand for gas becomes greater. All the settings discharge their spent gases into one chimney, which is 40 inches in diameter inside, and nearly 100 feet high. A Cornish boiler, with 215 square feet of heating surface, and a supplementary boiler with 65 square feet, both also discharge their flue gases into the same chimney. The two boilers barely suffice to meet requirements in the depth of winter; and as the small one is old, the question of an extension of the boiler installation has become imperative. The steam requirements of the works for power purposes, vertical retorts, heating buildings, offices, and gasholders have been computed to be equivalent to: On 200 days, about 220,000 B.Th.U. per hour; on about 140 days, 780,000 B.Th.U. per hour; and on about 30 days of hard frost 1,560,000 B.Th.U. per hour. The fuel hitherto used has been about 140 tons of coke breeze, 190 tons of coke, and 130 tons of coal, valued at £348 10s., which, with boilermen's wages amounting to £75, gives a total cost of £423 10s. per annum.

POSSIBLE SOURCES OF HEAT RECOVERY.

The possible sources of heat recovery on the works were reckoned by the Carlsruhe Instructional and Experimental Works to be as follows.

Sensible Heat of the Coke.—The specific heat of coke is not exactly known, but may be taken at a mean value of 0·38 between ordinary temperatures and 1800° Fahr. Hence 1 lb. of coke in cooling from 1800° to ordinary temperatures should yield something like 1750 × 0·38 = 665 B.Th.U., if losses are disregarded. This would correspond with an economy of about 5 per cent. in the fuel consumed for heating the retorts if the producer furnaces were charged with hot instead of cold coke. Attempts also have been made to stifle the hot coke and utilize its heat, instead of quenching it; but particulars have not been disclosed.

Sensible Heat of the Gas.—The specific heat of coal gas is equivalent to about 0·023 B.Th.U. per degree Fahrenheit per cubic foot of gas. The available fall of temperature of the gas is only about 90° Fahr., or (say) from 160° to 70° Fahr. Therefore, with a mean daily make of 210,000 cubic feet, there should be available: 210,000 × 90 × 0·023 = 434,700 B.Th.U., or, in round figures, 435,000 B.Th.U. This is equal to about 34½ lbs. of coke, having a calorific power of 12,600 B.Th.U. per pound, per diem, or about 5·6 tons of coke per annum. Having regard, however, to the facts that the sensible heat of the gas could certainly not be utilized without a loss of at least 25 per cent., and that the rate of cooling or condensation of the gas has to be governed primarily by considerations (such as naphthalene extraction) which would be opposed to economical transmission of heat to a boiler, there appears no prospect of a more or less costly installation for utilizing the sensible heat of the coal gas becoming remunerative.

Sensible Heat of the Flue Gases.—A temperature of 480° to 570° Fahr. is requisite for the chimney draught. Generally the attempt is made to work the settings so that the flue gases are discharged into the chimney at 750° Fahr. at the highest; and in that case it would scarcely pay to apply the heat of the flue gases to other purposes. In cases where their temperature of discharge is higher, the better course would be to control the working of the settings by analysis of the gas entering the recuperator, and thus avoid late combustion.

The value of the sensible heat of the flue gases may be calculated thus: If the flue gases contain about 18 per cent. of carbonic acid, and the coke used as fuel contains 15 per cent. of ash, the volume of flue gas proper per pound of coke consumed should be about $\frac{85 \times 3000}{100 \times 18} = 141$ feet. The specific heat of the flue gas between 750° and 930° Fahr. is equivalent to 0·023 B.Th.U. per degree Fahrenheit per cubic foot, and thus for a fall of 180° Fahr. (100° C.), the total heat available for utilization amounts to: 141 × 180 × 0·023 = 584 B.Th.U. per pound of coke consumed. This quantity of heat corresponds with about half-a-pound of steam, of half an atmosphere above normal pressure, obtainable from the heat of the flue gases for every pound of coke used as fuel in the producer furnace. But even by cooling the flue gases from (say) 1290° to 570° Fahr., the fall of temperature would be so small comparatively that the boiler would require to have a very large heating surface, and there would be great losses by conduction and radiation, or the rate of flow of the hot gas would have to be greater than would accord with a really high utilization of their heat. For these reasons, and out of consideration for reliability, the production of steam at high pressure (six to eight atmospheres) seemed impracticable.

The Pintsch-Bolz settings, however, have an equipment on these lines; the lower part of the chimney being encased by a boiler envelope, in which the comparatively hot (from 1110° to 1470° Fahr.) flue gases provide the steam needed for the producers and for making water gas in the retorts. An installation at Düsseldorf which has been investigated did not, however, afford sufficient steam, unless the fuel consumption was raised with a view to increasing the steam production.

While the foregoing considerations showed that, for a works of 70 million cubic feet per annum production, recovery of the sensible heat of the coal gas and of the hot coke would be useless, it appeared that the whole of the steam required on the works could be obtained from the surplus heat of the flue gases in conjunction with ulitization of the radiation from the settings. Some data from the working of the vertical retort settings at Aschaffenburg were obtained at the end of the year 1913. The temperatures in the combustion chamber, at the level of the first and second flues, averaged, in three retort-settings, respectively: (1) 2174° and 1992° Fahr.; (2) 2264° and 2003° Fahr.; and (3) 2309° and 1850° Fahr. The temperatures at the first level were not therefore exceptionally high. The temperatures of the products of combustion alongside the doors of the producers at about the level of the eye were, to left and right of the settings: (1) 1166° and 1400° Fahr.; (2) 1376° and 1432° Fahr.; and (3) 1380° and 1328° Fahr.—giving an average of 1346° Fahr. These temperatures are rather high, and suggest that at times comparatively large quantities of combustible gas enter and burn in the regenerative passages. Some analyses of the flue gases at the inlet and outlet of the passages showed that they were free from serious leakage. It appeared that the flue gases left the setting at an average temperature of 1346° Fahr., and containing an average of 18·2 per cent. of carbonic acid. If there were no question of utilizing the sensible heat of the flue gases, it would undoubtedly be possible so to control the combustion in the setting as to secure better results; but this would entail much expenditure of time.

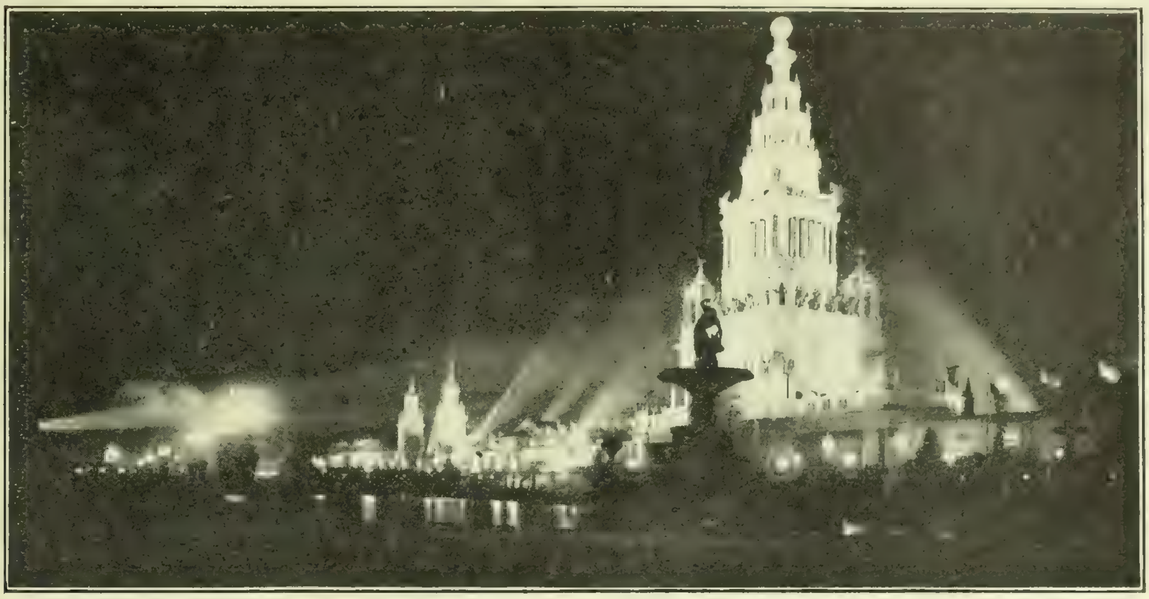
The possibilities of utilizing the sensible heat of the flue gases with a minimum (summer) make of 140,000 cubic feet and a maximum (winter) make of 280,000 cubic feet per diem, may be stated thus: The heat recoverable per pound of coke consumed in heating the settings for a fall of temperature of 180° Fahr. is in practice about 540 B.Th.U. [584 B.Th.U., in theory—*vide supra*]. If an available fall of temperature of 360° Fahr. is assumed, then in summer, with 6600 lbs. of coke used daily as fuel, there would be: 2 × 540 × 6600 = 7,128,000 B.Th.U. per 24 hours, or nearly 300,000 B.Th.U. per hour. If an available fall of 450° Fahr. and a daily consumption of 11,000 lbs. of coke were taken for the winter, there would be: 2·5 × 540 × 11,000 = 14,850,000 B.Th.U. per 24 hours, or nearly 620,000 B.Th.U. per hour.

Earlier investigations by Herr Kraus, of Stuttgart, indicated that the heat lost by radiation from the settings was rather greater than the recoverable flue-gas losses. Assuming that half the heat radiated from the settings can be recovered by enveloping the sides and top of the settings with systems of water-tubes, it follows that the whole needs of the gas-works for steam for power and heating purposes will be more than met by the heat recovered from the flue gases and the settings. But Herr Kraus, as well as Herr Hollweg, of Munich, who had also studied the question, considered that the recovery of the heat as high-pressure steam was a difficult matter, which could not be advocated. They, however, contemplated putting the boiler within the setting, and it is very much simpler, especially with vertical retorts, to place it on top, and to arrange for a portion of the flue gases to circulate round the boiler before they heat the air supply. If this is done while one system of tubes takes up further surplus heat from the flue gases and another, placed in the insulation of the top and side of the setting, intercepts as much as possible of the heat which would be dissipated by radiation, it is quite possible to produce steam at high pressure. The boiler and systems of tubes, in so far as they are directly in contact with the flue gases, must be of such dimensions that they can be readily regulated, and will not interfere with the proper working of the setting. Experiments in this direction are in progress at the Aschaffenburg works; but owing to various causes of delay, results cannot yet be reported. Trials are also being made there of the transmission of heat by means of simple insulated water-pipes.

GAS LIGHTING AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION, SAN FRANCISCO.

By C. B. Babcock, of San Francisco, the Chairman of the Publicity Committee.

[From the "American Gas Institute News," Aug. 1.]



NIGHT VIEW, TOWER OF JEWELS AND AVENUE OF PALMS, SAN FRANCISCO EXHIBITION.

It is evident to every visitor to the exposition—even to the most casual observer—that gas for lighting purposes is far from being a back-number. This source of lighting has been utilized to the greatest extent—in fact, in portions of the grounds, entirely depended upon. One has but to travel through the great State and Foreign Section, along the Avenue of Progress, Avenue of Palms, Administration Avenue, and the *Zone* to notice the predominance of gas street lighting.

This may seem almost like hearsay to the average layman, and even the technical electric man, but upon investigation the facts prove the statements, and gas men the world over are more than pleased at this just recognition of the great qualities of gas for street illumination. Its light is soft, pleasing, and well-distributed—quite a contrast to the jarring rays of the more brilliant current. Many of the most pleasing lighting effects produced have been made possible only through the use of the old and familiar gas, but utilized in the most modern development of the gas-lamp maker's art.

The Panama-Pacific International Exposition is not, as some would have us believe, an exclusive exhibit of electric illumination, although it plays a great part; and this article is to point out that gas lighting is in reality a great factor in the success of the illumination scheme at the exposition.

At midnight all electric lighting is turned off, and gas is used entirely for patrol lighting; for it is far more dependable, and less liable to be affected by the elements.

It is interesting to note that 50 per cent. of the entire output of gas in the United States is used for lighting purposes; and this in spite of the fact of strong competition and the development of gas appliances wherein gas is used for domestic and industrial fuel.

Artificial lighting is acknowledged to have furnished one of the greatest benefits to mankind; and in this work gas should be recognized as one of the greatest factors.

On the *Zone* (the playground of the exposition) the adaptability of gas as an ornamentation scheme is most vividly portrayed. There are 72 posts, installed 75 feet apart, each post 39 feet in height, and surmounted by a conventional sea lion. At the height of 20 feet from the ground ¾-inch pipe runs out, forming two arms encased in staffwork—the sea lion effect being still carried out. From these arms are suspended two five-mantle, low-pressure lamps, giving 900-candle power each. The lamps are encased in lanterns of various designs, the latter being a wooden frame work with canvas covering.

The distribution of gas throughout the *Zone* is high-pressure; so a regulator is placed at the base of each post, and there also is installed a ¾-inch bye-pass cock. This, in connection with the mercury valve distance-lighting equipment, makes it possible to turn on and off the lamps at the base of the post.

The soft, pleasing rays of gas diffused through the vari-coloured lanterns give an ornamental, and withal a restful look to this street of amusement.

At all of the exits and entrances of the exposition grounds low-pressure gas-lamps are installed, and burn nightly; and at two of the entrances and all the exits gas arcs are used exclusively.

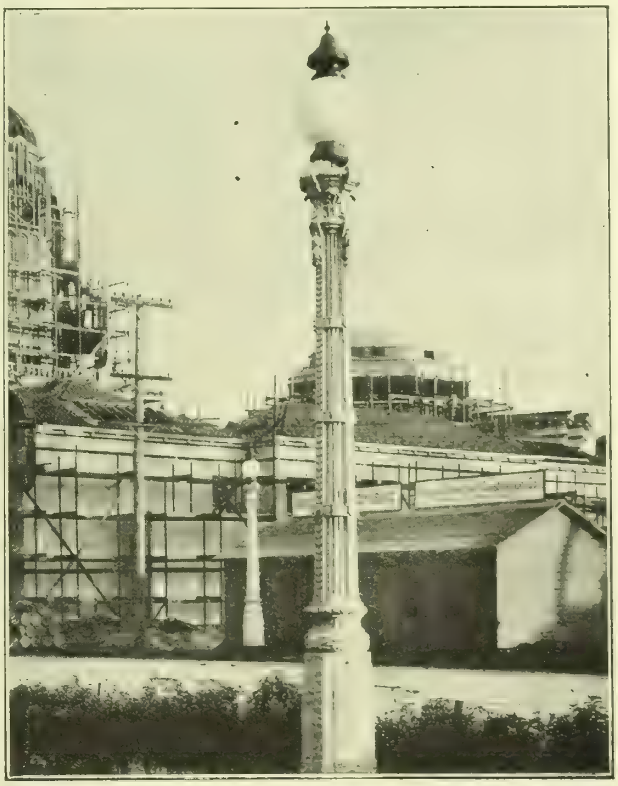
Throughout the large area comprising the State and Foreign Section, high-pressure lamps are installed, one to the post, on 2½ lbs. pressure, two mantles to the lamp, and giving 1100-candle power.

One enters the Court of the Universe at nightfall, and from out the serpent-headed urns great tongues of flame dart hither and yon, now flickering, now stretching forth in ecstasy, a weird light from out the past, beckoning—ever recalling the fires that burned on the altars of Ancient Rome. This effect is produced by the use of high-pressure gas pouring through ½-inch pipe.

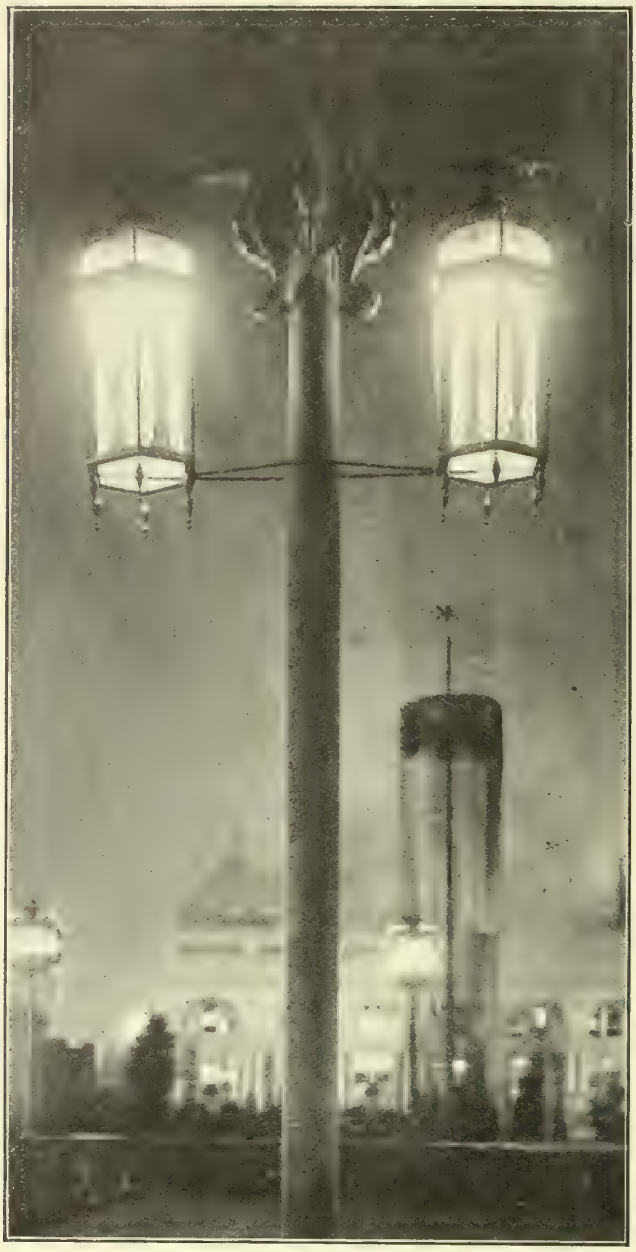
Not only is gas lighting used by the exposition proper, but practically all the buildings on the grounds are piped for gas, and modern gas-lamps installed, government buildings, railroad company exhibits, and concessions on the *Zone*.

In the corridors surrounding the courts of the exposition buildings gas-lamps are also used, and installed on beautiful staffwork brackets. So if the entire electric lighting equipment should be out, the crowds nightly viewing the fair would be able to find their way safely out of the grounds.

For many years it has been the dream of the older men of the gas industry to make a great exhibit of manufactured equipment used in the gas business, and so, through the efforts of a number of the leaders of the gas business, and the manufacturers of appliances, this consummation came about, and the "Collective



High-Pressure Gas-Lamps in the Foreign Pavilions Section of the Panama-Pacific Exposition.



Type of Low-Pressure Gas-Lamp Installed on the Zone at the Panama-Pacific International Exposition.
Lamps enclosed in Various Designs of Lanterns.

Gas Exhibit," comprising 10,000 feet of space in the Palace of Manufacturers, embodies the realization of their dream.

There is much of interest in this collective gas exhibit; but the first thing that attracts, and the memory of which will long remain, is the beautiful and artistic lighting effect. In the centre of the collective gas exhibit building is a great dome, 30 feet high, 28 feet square; and suspended from the dome, 20 feet from the floor, is a massive gas fixture equipped with eight five-mantle, low-pressure gas arc-lamps, with mercury-valve distance-control. The candle power is approximately 5600; and the distribution of light is perfect. As this is the largest gas fixture on the Pacific Coast, it has made a deep impression on all visitors.

The lighting of the booths in this exhibit (of which there are sixty-one) is entirely with semi-indirect fixtures, either in oxidized brass or in Roman gold finish. These lamps are equipped with most beautiful types of glassware. There is no glare; and the lighting arrangement helps to make this exhibit a pleasing place to come to, and where one may spend some profitable and pleasant hours.

On the posts in the aisles are large single-mantle and two-mantle lamps at a height of 9 feet. These hang on very artistic brackets; and as the lamps are in different colours, they bring about a most pleasing effect, and one which relieves any monotony, and withal harmonizes well with the general colour scheme.

The outside of the building is lighted with five-burner outdoor lamps of special design, so that all visitors entering the Palace of Manufactures are bound to be attracted by the pleasing lighting effect.

It became necessary shortly after the exhibits were installed in the building to hang signs stating "Lighted by Gas," as many visitors were heard to speak of the beautiful electric fixtures.

In full recognition of the splendid exhibit made of gas appliances, the Jury of Awards has given the Grand Prize to the collective gas exhibit.

The manufacturers of lighting equipment are wide awake and alive to the great future of gas lighting, and for many years past, and at the present time, have put the best of their brains and capital in making it possible for the gas companies to hold their own against competition. Surely with the modern appliances at their command, there is no valid reason why gas lighting should not still continue to hold a dominant place in the lighting of the world.

It has been deemed fitting by the leaders in the gas industry that this collective gas exhibit be held in San Francisco during the exposition commemorating the completion of the Panama Canal—the greatest achievement of modern times—in order to show to the world that the gas industry has kept pace with modern progress and development.

Before the close of this great exposition, on Dec. 4 next, every gas man should make an effort to visit it; and when he comes he will be sure of a hearty welcome, for "California invites the world to the Panama-Pacific International Exposition."

RESEARCH WORK AT THE NATIONAL PHYSICAL LABORATORY.*

It was pointed out in the report of the National Physical Laboratory for the year ended the 31st of March last [see "Journal," Vol. CXXX., p. 692] that research work in many departments of the laboratory had necessarily been curtailed owing to reduction of staff, consequent on the call of many members to the colours, and to imperative work having been undertaken for the Admiralty and other government departments. This curtailment of research has not yet had time to affect the published records of the work done at the laboratory, as the volume of "Collected Researches" just issued shows.

This volume contains eleven papers, of which two—both by Messrs. Clifford C. Paterson and B. P. Dudding, of the Physics Department—are of direct interest to gas men. An abstract of one, on "The Unit of Candle Power in White Light," which is reprinted from the Proceedings of the Physical Society, has already been given in the "Journal" [Vol. CXXX., p. 448]. The paper is a succinct record of a prolonged series of investigations, in which six observers were generally concerned, and the extent of the ground covered is indicated by the following synopsis: (1) The differences in the colour of the light radiation from different sources of white light cause uncertainties in photometric determinations which may be minimized by the use of the cascade principle. (2) Six sets of electric sub-standards of candle power are described, varying in colour from that of the pentane lamp (red) to that of a tungsten-vacuum lamp operating at 1·5 watts per candle. (3) The differences between the values obtained by different observers in the process of stepping from one colour to the next are discussed and compared with those obtained by the direct comparison of the first and last sets of sub-standards. (4) The probable errors of the determination are discussed, and shown to be of the order of 0·25 per cent. (5) The absolute value of the unit of candle power has been re-determined from the pentane lamp, and found to agree to within less than 0·1 per cent. with the determination made by Mr. Paterson ten years ago. (6) The corrections to the pentane lamp for humidity and barometric changes have been re-determined and found to agree within narrow limits with those previously found by Mr. Paterson. (7) The relation between the humidity and temperature corrections for the pentane lamp is discussed; and it is suggested that these two effects acting together may account for the discrepancy between the humidity constants of the lamp as determined in London and Washington.

The photometric work involved in these investigations must indeed have been laborious, and Messrs. Paterson and Dudding deserve the thanks of all to whom accuracy in photometry is of importance for the assiduity with which they have pursued this fundamental research. Incidentally, the authors refer to the flicker method of comparison in the following words: "Several flicker photometers were tried by four of the observers, but the precision of the measurements was found to be so inferior to that obtainable with the Lummer-Brodhun photometer that, after much time had been spent, the attempt was abandoned. The authors were unable to experience the sensitivity claimed for the flicker photometer by some other experimenters, and the results they obtained with it were of quite a different order of accuracy from those forming the subject of this paper. Moreover, it is found that the fatigue occasioned by continuous photometric observation throughout a whole day necessitated by these standardizations was very serious with the flicker photometer, and tended still further to diminish the sensitivity."

The second paper by Messrs. Paterson and Dudding is on the "Estimation of High Temperatures by the Method of Colour Identity," and is also reprinted from the "Proceedings" of the Physical Society. It describes preliminary experiments on the method of "colour identity" for estimating the temperature of incandescent substances such as metal or carbon radiating in the open, by which method the "true" temperature of certain bodies as distinct from their "black body" temperatures can be arrived at with a very fair degree of accuracy. By the colour identity method, the total luminous radiation (white light) from a black body is made identical in colour with that from the incandescent metal under examination by adjusting the temperature of the black body until there is colour identity in the field of a Lummer-Brodhun photometer. Comparisons have been made with the results obtained by other methods, and the colour identity method has been shown to give the correct result for melting platinum—viz., 1750° C. The importance is shown of the colour of the radiation from any proposed standard of light. The increasing efficiencies of modern sources of light owe these increases mainly to higher running temperatures, and hence the light emitted tends to consist of a relatively larger proportion of shorter waves. The light from the Hefner lamp has been found by the authors to correspond in colour with that from a black body at 1540° C., and that from the pentane lamp to 1610° C.

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* The National Physical Laboratory. Collected Researches, Vol. XII., 1915. London: Harrison and Sons; 1915.

The authors have applied the method described in their paper to determining the temperatures of the filament in various types of incandescent electric lamps run in stated conditions. It would be interesting if the method were extended to the measurement of the temperature of the mantle substance in high and low pressure incandescent gas-burners.

The volume also contains an interesting paper, of a preliminary character, on the "Emission of Electricity from Various Substances at High Temperatures," by Messrs. G. W. C. Kaye and W. F. Higgins, assistants in the Physics Department. The other papers in the present volume of "Collected Researches" do not call for comment in the "JOURNAL."

COKING AND BYE-PRODUCTS.

By "Event and Comment."

MANUFACTURE OF EXPLOSIVES.

MANY coke-oven people are of opinion that the present is an opportune time for developing the scope of coke-oven activities and for entering on the manufacture of new chemical products. The writer has previously stated in these notes that, in his opinion, it would be wisest to confine such developments to the production of the so-called intermediate products, except in very special cases where the facilities for the commencement of the new industries are exceptional. The manufacture of explosives at the present time is, of course, of predominant interest; but industrially the manufacture of synthetic dyestuffs, and also of pharmaceutical chemicals, is equally important. It must always be remembered, however, that these industries are highly specialized, and that trained men are essential to carry them on. Such trained men are almost impossible to get hold of at present, and indeed their number is very limited.

Picric acid and trinitrotoluene are, of course, the explosives which are of most interest to coke-oven people—the former being a derivative of carbolic acid, and the latter of toluene. The manufacture of picric acid has been carried on for a number of years; but that of trinitrotoluene is comparatively new, and hence little is known of it by the average person. It has been largely developed by the Germans as a modern explosive; and they have made full use of the large supplies of toluol which they have available from their numerous bye-product coke-ovens. It is being stated again and again that toluene is obtained solely from coal tar. This is not correct, as a very large proportion of it comes from the crude benzol which is nowadays extracted on most coke-oven plants. Crude benzol is a mixture of varying proportions of benzene, toluene, xylenes, solvent naphtha, &c., and has to undergo many refining operations before the toluene extracted from it can be used for the manufacture of T.N.T. It is essential, in order to produce the best quality of explosive, that the toluene used shall be as nearly pure as possible; and for this reason the product is very carefully fractionated and only the proper fraction is employed. The nitrification of toluene to form T.N.T. is not a dangerous operation in the sense that there is a risk of explosion, and the T.N.T. itself is quite safe to handle. The nitration is carried out in three stages—mono-nitro, di-nitro, and tri-nitro toluene being respectively produced. Each nitration involves the use of a considerable quantity of both nitric and sulphuric acids; hence it is most important that before considering the manufacture of T.N.T. the requisite supplies of acid should be assured. At the present time both acids are scarce: and the lack of sulphuric acid for sulphate of ammonia manufacture is very acute. A considerable quantity of mixed nitric and sulphuric acids is produced during the process, and the difficulty of putting these to satisfactory use adds greatly to the expense of the manufacture. For use in shells, the T.N.T. is usually melted and poured into the shells in the molten state; a fulminate of mercury cap being used to explode it. T.N.T. is a pale yellow crystalline body melting at about 82° C., is very stable, and will stand long exposure at all normal temperatures without undergoing any change.

LAST DAYS OF BEEHIVE OVENS.

At the present time there is not much incentive to colliery people to spend large sums of money in erecting new plant, owing to the abnormally high cost of material and also to the high cost of labour and the scarcity of men. One would think, however, that if any final argument was needed against the continuation of beehive coking, surely it is supplied by a review of our circumstances just now with regard to munitions of war. In a broad sense, bye-product coke-ovens have saved the country from a very serious situation indeed, as without them we should have been in a deplorable position as far as high explosives are concerned. Enormous quantities of tar and benzol are recovered from bye-product ovens which five years ago were not available. It is frequently said that had Germany been at war with us five years ago, our preparations and resources would have been far better than they are, while those of Germany would have been much less advanced. This may be very true in some respects; but from the point of view of high explosives it is certainly not correct. Comparatively few bye-product coke-ovens have been erected in Germany during the last five years [they had done away with beehive ovens long before that]; while in this country there has been enormous development.

It will be seen from the previous note that we are very largely dependent on bye-product coke-ovens for our supplies of high explosives. Beehive coke-ovens contribute nothing which can be used for the manufacture of explosives. Nay—worse than that—they actually waste enormous quantities of raw materials. If the coal which is to-day carbonized in beehive ovens were treated in bye-product ovens instead, our supplies of raw material for explosives would be increased at least 50 per cent., as most of the beehive ovens are dealing with high volatile coals which yield both good quantities of tar and of benzol. Beehive coking, therefore, at the present time is a national danger, and it is surprising that the Government has taken no action to restrict it. The writer was informed only last week that certain bye-product ovens could not be worked at full capacity owing to lack of men. If this is correct, then it ought to be remedied, even if it means compulsorily closing beehive ovens to get the necessary men. Just now coke is fetching a very high price, and beehive ovens can be worked at a fairly substantial profit. In some cases—particularly small plants—the beehive ovens could not be replaced by bye-product ovens; but in many instances assistance might well be given by the Government to erect new ovens, and obtain the advantage of the additional output of munitions.

Presentation to Mr. Doig Gibb.

The current issue of the "South Metropolitan Gas Company's Co-Partnership Journal" contains a notice of the officers' present to Mr. W. Doig Gibb on the occasion of his retirement from the position of Chief Engineer of the Company. From this it appears that Messrs. Braidwood, Browne, Baily, Rossiter, and Stokes were deputed to present to Mr. Gibb, on behalf of their brother officers, a farewell address, together with a rose-bowl and candelabra in silver. The rose-bowl bears this inscription:

> Presented to W. Doig Gibb, Esq., M.Inst.C.E., by the officers of the South Metropolitan Gas Company, as a mark of their sincere regard and esteem on his resigning the position of Chief Engineer, June, 1915.

The presentation was made in well-chosen words by Mr. Braidwood, who said that he hoped both Mr. and Mrs. Gibb would regard the gifts as but a slight tangible expression of the sincere feelings of esteem entertained towards him by the staff of the Company, and of the earnest wishes of all his former colleagues for his speedy return to robust health. The other members of the deputation cordially endorsed Mr. Braidwood's remarks. In the course of a characteristically happy speech, Mr. Gibb acknowledged the kindly gifts. The members of the deputation, it is added, were very gratified to find Mr. Gibb improved in health and to hear that his doctor's latest report was most encouraging.

Further Restriction of Coal Exports.—The announcement is made by the Board of Trade that, by an Order of Council, the exportation of coal and coke will no longer be permitted freely to Allied countries after Friday next, and will be prohibited to all destinations abroad other than British Possessions and Protectorates. Applications for licences to export these commodities to prohibited destinations should, as hitherto, be addressed on a special form to the War Trade Department, No. 4, Central Buildings, Westminster, S.W. Commenting upon this notification, "The Times" says: "This further restriction placed on the export of coal is clearly a result of the Bill limiting the price of coal. It was obvious that when a maximum price for coal was fixed in this country, there would be a tendency to export large quantities to countries where there was no such maximum price in force. . . . There is, we believe, no intention whatever of restricting the reasonable requirements of the Allies, whether they need the coal for their railways or industries." The following official statement was issued by the Foreign Office at the end of the week: "The Secretary of State for Foreign Affairs desires to explain that this regulation is in itself in no way intended to alter the actual state of affairs with regard to the export of coal beyond the fact that licences will be required for coal exported to any place which is not a British possession or protectorate. The order is not designed for the purpose of entirely preventing coal exports, but is the consequence of certain domestic legislation by which the price of coal in the United Kingdom has been regulated, thereby rendering necessary a control of the British coal trade for the purpose of maintaining a proper proportion between home and foreign consumption."

THIS YEAR'S EXAMINATION IN "GAS-FITTING."

List of Successful Candidates.

The pass-lists for the last City and Guilds of London Institute examinations in "Gas-Fitting" have been sent to the Institution of Gas Engineers; and they have been forwarded to us for publication by Mr. Walter T. Dunn, the Secretary. The questions set by the Examiners—Mr. H. Kendrick and Mr. R. Halkett—appeared in the "Journal" for May 4 (p. 290). The names of the prize winners are given on p. 282 of to-day's number.

GAS FITTING.

FINAL GRADE.

First Class.

Bewsher, Bryan
Blair, William
Carr, George
Chiverill, Henry W. F.
Cottle, Ernest A.
Cotton, Ernest J.
Doak, David
Dowling, William J.
Downton, Ernest M.
Eabry, Richard G.
Filby, George
Flaherty, William
Fraser, Hugh
Fulton, Robert
Johnston, Robert
Lett, Thomas W.
Lewis, Richard S. B.
Muggleton, Herbert
Myers, Thomas O.
Pascoe, Archibald T.
Park, Harold G.
Platt, Arthur H.
Reid, Robert
Rutherford, Henry
Shore, Charles L.
Smith, David
Tansley, William H.
Walton, John

FINAL GRADE.

Second Class.

Catton, Albert E.
Crathorn, Ernest
Davis, Frank W.
Dempster, James
Duffield, Oliver
Evans, James G.
Gunner, Leonard W.
Humphries, William
Incledon, Albert
Maull, Solomon
Nicholas, Albert E.
Power, Arnold J.
Speirs, Alexander
Stout, William
Thomas, Leonard J.
Woodland, Charles R.

GRADE I.

Allen, Ernest A.
Allum, Frank E.
Ayscough, Charles A.
Barker, John
Battishill, Harry W.
Bayne, Alfred
Bessom, John W.
Blake, George W.
Booth, John A.
Bridge, John
Burrell, Charles H.
Burton, Edward P.
Carpenter, Arthur S.
Chapman, Cyril S. P.
Clare, John
Clare, Leverington
Clarke, Frederick H.
Chorlton, William
Collins, Leonard
Crayden, Alfred J.
Creese, Thomas
Creswell, Albert
Davidson, W. G. E.
Dean, George E.
Doley, Henry
Doyle, Vincent
Dunn, John
Duncalfe, George H.
Dyson, Thomas
Fifield, Hugh S.
Fiford, Charles S.
Fitton, Leonard
Fletcher, William
Fudge, Percy
Grigsby, Arthur E.
Green, Richard
Guest, William
Hall, Alfred
Hancock, Herbert
Haynes, Percy W.
Hewlett, Reginald V.
Hildred, Joseph F.
Holmes, Robert H.
Holt, William
Holroyd, John W.
Houghton, Albert V.T.
Hubbard, Harold C.
Huggett, Alfred
Humphbeson, Fred. J.
Johns, Richard
Johnson, Harold
Jones, Arthur B.
Jones, Thomas
Lamming, Thomas H.
Lawe, John H.
Leaver, Sidney
Lea, William C.
Lister, Albert W.
Lovsey, William E.
M'Cartney, William E.
Mann, William R.
Maming, John
Meek, Harry
Metcalf, Francis H.
Millett, William J.
Moles, Harold
Moss, Richard H.
Morton, Sydney H.
Murrin, Willie W.
Neale, John F.
Neely, William G.
Partridge, Howard
Perry, Edwin J.
Pilkington, Joseph
Pinn, Stanley
Pope, William R.
Price, Charles H.
Robins, Leonard
Robinson, Horace J.
Rushby, Harold
Salt, Thomas
Saunders, Arthur S.
Scott, Arthur
Sherriff, Tom
Shone, John
Spurgeon, Charles E.
Starkings, Thomas W.
Surtees, Joseph
Trevitt, Robert
Trobe, Norman
Vorley, William A.
Walker, Frederick
Walker, Harold S.
Wallace, Eric
Wastell, Sidney
Whitlam, Herbert R.
Whitworth, John A.
Wilkes, William A.
Williams, Thomas
Willis, Frank D.
Willmot, Francis J.
Woodcock, Herbert G.
Wright, William G.
Wynn, Harold J.

GRADE II.

Akerman, Edwin J.
Bacon, Alfred J.
Bellamy, Frederick B.
Bevan, Leonard
Brooks, Charles
Buchanan, John
Burrows, Albert
Carlton, John W.
Casey, Frank R.
Crabtree, Harold G.
Creasey, Arthur E.
Cree, Ernest
Davies, Frederick
Dale, William E.
Day, Edward
Entwistle, William E.
Evans, Joseph L.
Ford, Francis V.
Ford, Frederick R.
Gardener, Walter F. J.
Gay, Edward H.
Glanville, Percy J.
Grimsley, William
Harrison, Norman H.
Helyar, Ernest
Hislop, Harry
Holben, Arthur R.
Holmes, George
Holmes, James
Hyde, Joseph P.
James, Alfred
James, Edward
Moden, Robert
M'Call, William
M'Morrow, William J.
Morgan, Lloyd T.
Naish, John T.
Nicholls, Adolphus W.
Penny, Charles
Pickett, Edgar
Plevin, Edwin
Potter, Sidney J.
Salway, Bert
Smith, Ernest T.
Smith, Frederick
Squires, Ernest H.
Stock, Arthur R.
Telling, Thomas J.
Tripp, Alfred J.
Toms, Alfred T.
Vail, John B.
Viney, Walter J.
Wardell, John C.
Wardle, Thomas J.
Webb, George F.
Whitehouse, Harry
Woodley, Charles A.

THERMAL PHENOMENA IN CARBONIZATION.

The report by Mr. Harold Hollings, B.Sc., the Gas Research Fellow, and Professor J. W. Cobb, B.Sc., F.I.C., which was presented to the Institution of Gas Engineers at the annual general meeting in 1914, dealt with a portion of the work carried out during two years by them on "Thermal Phenomena in Carbonization." The report, which was given in full in the "Journal," Vol. CXXVI., p. 917, embodied (1) a critical study of the work of previous investigators, especially Mahler and Euchène, (2) a description of the authors' experimental method, and (3) the results of observations made by it of the heat absorbed or evolved at different temperatures when a bituminous coal [Monckton Main], in an inert atmosphere, was raised at a uniform rate from cold to about 1100° C. (2010° Fahr.).

A paper by the same authors, entitled "A Thermal Study of the Carbonization Process," which has been published in the current (July) number of the "Journal of the Chemical Society," repeats the description of their experimental method, and gives the results of its application to the study of other coals and allied materials. The following table contains the descriptions and analytical data of the materials reported on in this paper and the earlier report.

Following the experimental method applied to Monckton Main coal in the investigations described in the report to the Institution of Gas Engineers already referred to, the authors have now obtained "heating curves" for the other materials named in the table. In the case of pure cellulose, there was a sudden evolution of heat at 345° C., apparently due to chemical action at that temperature; whereas with dehydrated cellulose and lignite the evolution of heat extended from 280° to 420° C., and was probably due to a series of decompositions. Decomposition as sudden as that of cellulose has not been found with any coal. The sudden evolution of heat observed with cellulose is presumably connected with the expulsion of hydroxyl groups, with consequent molecular condensation in the residue. The corresponding evolution of heat begins in uncertain fashion with dehydrated cellulose and lignite at 280° C., but with coals, in which presumably cellulose is still further degraded, scarcely below 400° C. With anthracite, in which the degradation of cellulose is most nearly complete, there is practically no such evolution of heat at these low temperatures. Both the extract and the residue from extraction of bituminous coal by pyridine showed marked evolution of heat between about 200° and 320° C.; but no thermal phenomena were noticeable with the pyridine-chloroform extract. The high proportion of oxygen in this particular product probably arises from oxidation in the course of its extraction; and the oxygen in it may therefore be

Materials with which Observations were Made.

Nature and Origin of Material.	Volatile Matter by American Committee's Method.	Ash	Percentage of Ash-Free Material.				
			Carbon.	Hydrogen.	Oxygen.	Sulphur.	Nitrogen.
	Per Cent.	Per Cent.					
Anthracite, Ystradgynlais	5·97	2·12	89·20	4·31	3·91	1·34	1·25
Bituminous coal, Beeston (from Dr. R. V. Wheeler)	—	—	83·05	5·51	8·08	2·12	1·24
,, ,, ,, Pyridine, extract of	—	—	83·11	6·06	5·96	3·89	0·98
,, ,, ,, Pyridine, residue from	—	—	80·80	5·69	10·17	2·43	0·91
,, ,, ,, Chloroform, extract of	–	—	75·54	7·66	14·18	1·86	0·76
,, ,, ,, Chloroform, residue from	—	—	80·25	5·28	11·45	2·09	0·93
,, ,, New Hucknell	37·30	3·77	80·39	5·88	10·63	1·71	1·39
,, ,, Monckton Main	40·20	5·43	76·52	5·21	14·92	1·73	1·62
Cannel, Brodsworth	45·27	4·80	80·79	5·46	10·60	1·21	1·94
Lignite, Bovey Tracey	65·00	5·20	63·00	6·26	28·58	1·66	0·50
Cellulose dehydrated by strong sulphuric acid	65·20	1·13	58·11	4·11	36·68	1·10	—
Cellulose (cotton wool, theoretical composition)	—	—	44·40	6·20	49·40	—	—

regarded as in a different form from that in degradation products of cellulose.

The next stage in the heating—viz., between 400° or 450° and 600° C.—manifests the characteristic differences between the different types of materials. There is absorption of heat, which is most marked in the case of dehydrated cellulose, lignite, cannel, and the extract and residue from the pyridine extraction of bituminous coal. With bituminous coals there is merely a break in the evolution of heat about 500° C., and with anthracite there is some absorption of heat between 520° and 600° C. The thermal phenomena in this stage vary according to the nature of the coal, on which depends the quantity and quality of the oils, unsaturated hydrocarbons, higher paraffins, and oxygenated compounds produced.

The next stage, from about 600° to 800° C., is distinguished by evolution of heat, which is the more marked the less oxygenated is the coal or other material undergoing carbonization. Thus with cellulose, dehydrated cellulose, and lignite the evolution of heat from 600° upwards is not pronounced, but of the three it is greatest for the last-named, with which it begins below 600° C. With cannel and bituminous coal marked evolution of heat starts below 600° and continues to about 800° C.; while with anthracite there is a still more pronounced evolution of heat from 650° to 840° C. Both the extract and the residue from the extraction of bituminous coal by pyridine give heating curves which at this stage are in general agreement with that for the coal itself, though the evolution of heat is slightly less marked. It would appear, from the resemblance in behaviour of the extract and the residue and the oxidation effects, that prolonged extraction of coal by pyridine effects its partial decomposition and not simple preferential solution.

It is at this stage that methane predominates in the gas liberated; and since heat is evolved when methane is formed from its elements, it is likely that the considerable production of methane is chiefly responsible for the evolution of heat which with bituminous coal occurs in a most marked degree between 610° and 750° to 800° C. If it is a fact that the carbonization of coal as a whole is attended by evolution rather than absorption of heat, it would appear that the formation of methane is the principal factor in determining this evolution of heat.

Above 800° C., hydrogen is the chief product of the carbonization of the coal. The heating curves for cellulose, lignite, cannel, bituminous coal, and anthracite all show an absence of any evolution of heat at this stage, and in many cases there would appear to be a slight absorption of heat. This absorption is most marked with anthracite and cannel.

The authors are hoping to collect and examine the volatile products of carbonization at each stage of the evolution or absorption of heat, as ascertained by their method of observing thermal phenomena, in the case of one or two typical coals. They will thus become in a position to effect a useful chemical and thermal correlation for different stages of the carbonization process. The process of carbonization cannot be represented as a single reaction; and hence the value of determinations of its net thermal result is, in a sense, limited. At different temperatures reactions in which heat is definitely evolved are balanced more or less by reactions in which heat is definitely absorbed; and these reactions, of the existence of which a net result gives no evidence, may be of considerable importance. Evolution or absorption of heat occurring in a mass of coal at a comparatively low temperature may be regarded as increasing or decreasing respectively the liability to spontaneous heating—an important consideration both in the storage of great quantities of coal and in the behaviour of large masses of coal underground. All the reported results were obtained by raising the temperature of the coke in the control vessel at a uniform rate of 7° C. per minute; but owing to the difficulty with the electric furnace used of securing uniform heating below 200° C., no importance is attached to deflexions in the heating curves below this temperature.

In this digest of the author's communication to the Chemical Society an attempt has been made to correlate in as simple language as possible the new observations with those recorded in their former report, from which also some explanatory matter has been drawn.

Swiss Association of Gas and Water Engineers.—It is announced that the forty-second annual general meeting of this Association will be held at St. Gall on Sept. 11 and 12.

Wedding.—The marriage took place at St. George's, Hanover Square, last Thursday week, of Mr. W. Wythers Gray, the Manager of the Cambridge Water Company, and Miss Myra Pye, daughter of the late Mr. Richard Pye, of Forest Hill.

Issue of South Metropolitan Stock to Consumers.—In connection with the statement made in the report of the Directors of the South Metropolitan Gas Company that, to provide for the extending requirements of the business, stock to the amount of £100,000 is being offered to the employees and consumers, it may be mentioned that the price of issue is £82 per £100 of stock; and there will be no charges or expenses of any kind to be paid by purchasers. The offer is a good one; and as application may be made for allotments in amounts of £5 and multiples of this sum, a brisk demand may be counted upon. It is not surprising to learn that, so popular has this method of purchasing small amounts of stock become, that more than £1,430,000 has been invested in this way by the consumers.

A POWER PLANT PROBLEM.

Cost of Gas and Electricity.

One of the valuable sections of the "Power User" is that which is devoted to "Power Plant Problems," and the solutions offered by readers. The June issue contained several answers to a problem which had recently been set on the subject of the cost of gas and electricity; and we reproduce the main portions of the reply that was placed first by our contemporary, and which was by Mr. H. C. Widlake, of Plymouth, whose interesting series of articles on the "*£ s. d.* of Power Production" was completed in last week's number of the "JOURNAL."

The problem set by "J. C." (Glasgow) was: Which would be the cheapest power—gas or electricity? The Electricity Department here are prepared to lay cables for 300 yards, for which they require a revenue of £60 per year for three years. I would only be installing, to start with, a 22-H.P. motor, and expect to put down a further 20-H.P. motor in about nine months. Would the installing of electric power be cheaper than a 40-H.P. gas-engine (gas from town)? To this query, Mr. Widlake replied: "J. C.'s" question, unfortunately, leaves many factors to be assumed. He does not state, for instance, the load under which his plant will run; nor does he mention the rate at which the local gas supply authorities are prepared to supply him with gas. I also take it that the £60 per annum for three years, to which he alludes, is a capital charge made by the electric supply people to cover the cost of the 300 yards of cable extension, and is quite separate from the rate which will be charged for the current consumed.

For the purpose of the comparison about to be made, it will be assumed that he has the alternative of being supplied with either gas at 1s. 3d. per 1000 cubic feet or electricity at ¾d. per Board of Trade unit. The fact of his running for the first nine months with one motor does not affect this problem very much; and the comparison will be drawn between an installation of one 20-H.P. and one 22-H.P. electrical motor, running at about 900 R.P.M. and a 40-H.P. gas-engine. It will also be assumed his load factor is equivalent to full load on his plant for 2800 hours per year.

ELECTRIC MOTORS.

The yearly consumption of a 20-H.P. electric motor, assuming the efficiency to be 86 per cent., will be:

$$\frac{20 \times 746 \times 100 \times 2800}{86 \times 1000}$$

= 48,576 Board of Trade units,

that of a 22-H.P. motor possessing the same efficiency will be:

$$\frac{22 \times 746 \times 100 \times 2800}{86 \times 1000}$$

= 53,434 Board of Trade units.

The total consumption of electrical energy per year by these motors will be seen to be 102,010 units; and the costs of this installation will therefore be:

	£	s.	d.
Electrical energy, 102,010 units, at ¾d. per unit . . .	318	15	7
Interest on capital expenditure	8	4	0
Depreciation	8	4	0
Lubricating oil	1	4	0
Capital charge in respect to the cable extension. . .	60	0	0
Total	£396	7	7
Actual working costs per hour	33·9d.		
Actual working costs per brake-horse-power-hour . . .	0·807d.		

GAS-ENGINE.

A 40-H.P. gas-engine working on town gas having a calorific value of 500 B.Th.U., will take about 20 cubic feet per brake-horse-power-hour; and the annual cost of gas for this installation will therefore work out at:

$$20 \times 40 \times 2800$$

= 2,240,000 cubic feet per annum.

The working costs of this installation will therefore be:

	£	s.	d.
Gas consumed, 2,240,000 cubic feet at 1s. 3d. per 1000.	140	0	0
Interest at 5 per cent.	11	0	0
Depreciation at 5 per cent.	11	0	0
Lubricating oil	8	0	0
Actual working cost per year	£170	0	0
Actual working cost per hour	14·5d.		
Actual working costs per brake-horse-power-hour . .	0·36d.		

SUMMARY.

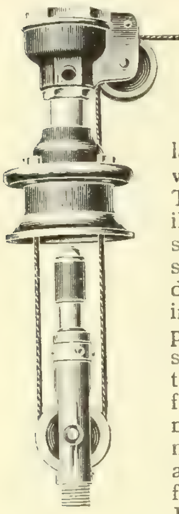
These figures may be summarized as follows:—

—	Working Costs.		Saving Effected by Using Gas-Engines.
	Gas-Engine.	Electric Motors.	
Per year.	£170	£396 7s. 7d.	£226 7s. 7d.
Per hour. . . .	14·5d.	33·9d.	19·4d.
Per B.H.P. hour . .	0·36d.	0·807d.	0·447d.

With gas at 1s. 3d. per 1000 cubic feet and electricity at ¾d. per unit, it is obvious from the above tables that, on the basis of energy alone, electricity would have to be retailed in the neighbourhood of 0·35d. per B.T.U. before it could, in "J. C.'s" district of supply, compete, on economical grounds, with gas-engines.

These figures, as has been pointed out, are based on the assumption that a 100 per cent. load factor is attained. The efficiency of both gas-engine and electric motors will be slightly lower at a lower load-factor.

GAS-LAMP LOWERING GEAR.



Attention is drawn by the London Electric Firm, of Croydon, to an installation of their patent auto-joint lowering gear in connection with the gas-fittings of a church. In such a position, of course, an arrangement like the Company's improved "One-working Part" automatic connector-suspender and their patent self-sustaining winch, for the lowering of the lamps for maintenance purposes, would prove to be a very useful contrivance. The joint, which is shown in the accompanying illustration, it may be remarked, provides for two supplies, thus permitting the adoption of a pilot system, so that lamps may be operated from a distance. The gas-joint is quite tight, withstanding as it does five times the pressure of high-pressure gas; while it is at the same time equally suitable for low pressures. It is pointed out by the firm that their system is one which is free from all unnecessary complications—there being no flexible pipes or supplemental parts which might be likely to prove troublesome. It has already been stated in our columns, when referring to the specialities of the London Electric Firm, that their patent lowering gear is meeting with great success, and is used in connection with street lighting in London, Glasgow, and other places. The devices are made applicable for all ordinary suspension, as well as for fixing to irregular roof members, for arches over gateways, &c. The gear is operated in the simplest possible manner.

Petrograd Gas Distribution Dispute.

A note from Petrograd says that the Gas Lighting Company (with offices in Paris) have laid down a system of pipes in the streets of the city for the supply of the Company's gas to private industrial works. The right to exploit gas and supply it to private houses and workshops, it is claimed, belongs to the town; and, in consequence, a legal complaint was laid against the Company. The Court found the action of the Company to be irregular, and ordered them to remove the pipes. The French Ambassador then appealed to the Town Council not to give effect to the judgment till the end of the war, as it would inflict losses on French people who hold shares in the Company. Out of consideration for the friendly nation, the Ambassador's request was acceded to.

Halifax as an Industrial Centre.

There must be contained in a book just published by Sells Limited, of Nos. 166-169, Fleet Street, E.C., a fairly complete record of all that there is to be said about Halifax. The title of the book, which is edited by Mr. J. P. Wadsworth, is "Halifax a Commercial and Industrial Centre," and the issue has been made under the auspices of the local Chamber of Commerce, Chamber of Trade, and Advertising Club. Though mainly prepared as a commercial guide, the work will be found to be of great interest to the historian and the antiquarian. The present commercial position of the town is a highly important one; but there is, of course, still ample room for expansion, and a feature of the book is a map of Halifax and district showing vacant sites suitable for commercial and residential purposes. Maps are also given of the transit facilities; and the book is profusely illustrated with excellent photographs. The gas, water, and electricity supplies are important points for those who contemplate settling in the town; and so it is natural that particulars should be given of the facilities offered to commercial and domestic consumers. Statistics with regard to the gas supply reveal the remarkable progress that has been made in this branch of municipal enterprise since the purchase of the undertaking by the Corporation for £35,000 in 1855, when the sales amounted to only 51 million cubic feet per annum, and the selling price was 4s. 6d. per 1000 cubic feet. In the ten years 1905 to 1914, the consumption of gas increased from 808 to 832 million cubic feet per annum; the capital employed was reduced from £531,000 to £433,000; the selling price from 2s. 3d. to 2s. per 1000 cubic feet, while all extensions and renewals have been made out of revenue. Glancing over other figures which are given, it is noticed that the capital employed per million cubic feet of gas sold, which in 1875 reached its maximum figure of £960, had by 1914 been brought down to £521. Of the 2s. per 1000 cubic feet received for gas in the latter year, 7·39d. was contributed to interest and sinking fund charges, and 2·77d. to relief of the rates, leaving a balance as net receipts of 1s. 1·84d. per 1000 cubic feet. An example of gas enterprise, it may be mentioned, is the inclusion in the book of a slip containing a beautiful coloured illustration of a modern gas-fire in use.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Briquettes from Gas-Coke Breeze.

Sir,—We notice Mr. Chaney's letter on this subject in the "Journal" for July 27. We would suggest the following items for the consideration of all gas managers in this country.

If one of the "Ovoid" briquette plants has been in continuous operation for three years in a German gas-works, why should not the same process be successful in this country also? We conclude that the Nuremburg plant must have been a success, or it would not have been kept in continuous work for that time.

Small coke breeze suitable for this purpose can be bought for less than 4s. per ton. Its conversion into satisfactory "Ovoids" is a simple and easy matter, provided suitable machinery is used for the proper mixing, preparation, and agglomeration of the materials, and that the "Ovoids" so produced are of the right shape and size. Given these, the density of the briquettes, when pressed, presents no difficulty in securing their efficient and rapid combustion—either under boilers for quickly raising steam, or for use in producer furnaces.

A good number of leading gas managers in this country are already carefully considering this question. We could arrange for suitable quantities of this fine breeze to be made up into "Ovoids" for testing purposes for any manager who is open to adopt the process if the result proves satisfactory.

Yeadon, Son, and Co.

Leeds, Aug. 6, 1915.

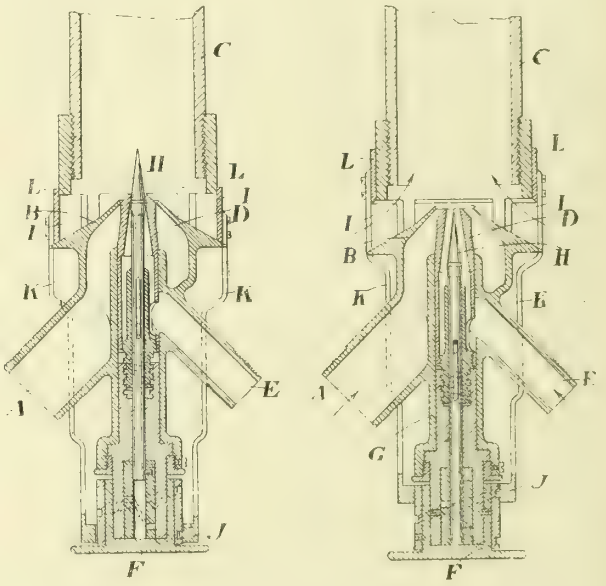
REGISTER OF PATENTS.

Regulating Burners Fed with Compressed Air and Gas.

Welsbach Light Company, Limited; a communication from the Deutsche Gasglühlicht Actien-Gesellschaft (Auergesellschaft), of Berlin.

No. 27,957; Dec. 4, 1913.

This invention relates to a regulating nozzle for compressed air burners; and vertical sections of the device show the parts in their two extreme positions.



Welsbach Compressed Air and Gas Burner Controller.

The gas flows in at A to the conical nozzle B, having a central opening, and from this into the mixing pipe C. The compressed air nozzle D is mounted axially and slidably in the interior of the gas-nozzle, which is provided with an opening through which it receives the compressed air from E; the nozzle D being connected to, and receiving motion from, a hand wheel F. Arranged within the casing G (with capability of rotation, but fixed as regards endway movement) is a member provided with an axial bore adapted to receive the spindle of a needle valve H. At its upper end it is furnished with a socket provided with a quick screw thread, and receives the correspondingly threaded end of a sleeve embracing the spindle and furnished with a threaded enlargement which carries the compressed-air nozzle.

Ways I are provided through which air is sucked in by the rush of compressed air and gas from the nozzles B D in the directions shown by the upper set of arrows, as well as means for opening and closing the ways at the same time that the nozzles are opened and closed and by the same movement of the hand wheel. For this purpose, the wheel is connected to an outer casing on the exterior surface of which a thread is cut in which an internal projection upon the ring J engages. Thus, when the wheel, and consequently the casing, is turned, the ring is moved longitudinally of its axis and communicates motion, by means of the rods K, to the slide valve L, so that the openings through which the air is sucked in become larger or smaller as the case may be. In this way, compressed air, air, and gas are all regulated by a single control.

Water Heating Apparatus or Geysers.

JUNKERS, H., of Aachen, Germany.

No. 3300; Feb. 7, 1914. Convention date, Feb. 13, 1913.

This invention relates to geysers of the type from which a continuous supply of water may be obtained from a container or pipes subjected to the action of the hot gases from a gas-burner in the lower part of the apparatus.

Such liquid heaters (in which the water is warmed during its passage through the heater) have numerous advantages, the patentee points out, in comparison with heaters in which large quantities are heated for storage, "particularly in point of reliability in working and of cheapness." Nevertheless, the use of this class of heater for the production of boiling water has been precluded in practice, because they frequently got out of order and furnished merely hot water—an objection which applies also to heaters fitted with a thermostat for regulating the cold water feed, since in these the member responding to the temperature is placed in the water, which later can only alter slowly in temperature. The consequence is to make the regulator "insufficiently sensitive."

This defect is said to be obviated by the present invention, inasmuch as the heat-sensitive capsule of the thermostat is not bathed or actuated by the water, but by the vapour given off by the heated water or by the steam when the boiling point is attained. To enable this to be effected with certainty, the outflow pipe for the boiling water is provided with a widened portion, and the heat-sensitive capsule of the regulating device is placed in a special chamber connected by a pipe with the steam space of the widened portion of the outflow pipe. This arrangement enables the chamber containing the regulating member to be in an unenclosed or exposed position and surrounded by air, so that as soon as the effluent water no longer boils and no more vapours pass to the chamber, the chamber cools down rapidly and causes the regulating device to respond very quickly. To accelerate the cooling effect, the chamber is provided with apertures through which the hot vapours or steam may pass away. Moreover, the regulating member can be disconnected by providing a closable bye-pass which branches off in front of the cold-water feed member influenced by the regulator, and reunites with the cold-water pipe in the rear.

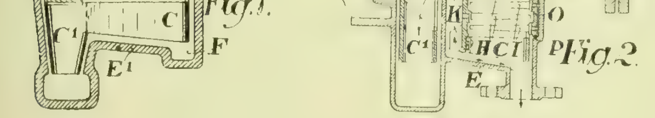
Centrifugal Gas-Washers.

THEISEN, H. E., of Munich, Germany

No. 9618; April 18, 1914.

This invention is a modification of the apparatus for removing solid and liquid impurities or components from gases according to patent No. 22,433 of 1910, as improved upon by a patent of addition No. 27,696 of 1911.

The patent of addition related to apparatus for removing solid and liquid impurities from gases in which, by an arrangement of twisted laterally open vanes of known type, the gas is first centrifuged on to a lateral washing surface, so that the washing of the gas, and thereby the removal of the impurities, takes place on the lateral washing surfaces; while the gas was centrifuged radially and led off in the fan casing. Catch gutters are disposed about the lateral washing surfaces, in order to collect and carry off separate from the gas the impurities centrifuged on to the lateral washing surface. The present invention relates to a further modification, more particularly for purifying small quantities of generator gases which are very rich in tars; "the consumption of power and water being very small and the construction of the apparatus as simple as possible."



Theisen's Centrifugal Gas-Washers.

Examples of apparatus according to the invention are illustrated in sections representing different modifications—the lower and upper halves of fig. 1 also representing different modifications.

The arrangement shown in the upper half of fig. 1 differs from the patent of addition in that the lower part C of the fan proper C^1 is to a certain extent drawn out laterally; and correspondingly the additional washing surface E^1 appears as a lateral addition to the fan casing. As in the patent of addition, the catch gutter F is arranged at the end of the washing surface E^1. The part C of the fan corresponding to the main vane C^1 is bent or twisted, and the disintegrator device is further so disposed that the mixture of gas, tar, and water which is intimately mixed and atomized therein is centrifuged directly or radially against the washing surfaces E^1 and centrifuged by the vane C, so that all of the impurities (more particularly the whole of the tar and water) are deposited in the gutter, while the approximately pure gas is sucked off laterally through the fan C^1 and carried away at a suitable pressure.

The main advantage, as compared to the arrangement of the patent of addition, lies in the fact that the mixture of gas, water, and tar which is atomized in the disintegrator is first of all vigorously centrifuged on to the washing surface E^1 and purified—thus preventing contamination of the vane proper, C^1, by particles of water and tar.

The form shown in the lower half of fig. 1 only differs from the upper half by the fact that the additional washing surface E^1 is broadened conically in the opposite direction, and the catch gutter F is thus arranged at the right-hand end. The operation of this modification is the same, except that the impurities are carried off on the washing surface E^1 towards the right into the catch gutter F; while the approximately pure gas is sucked off through the fan C^1 at the left.

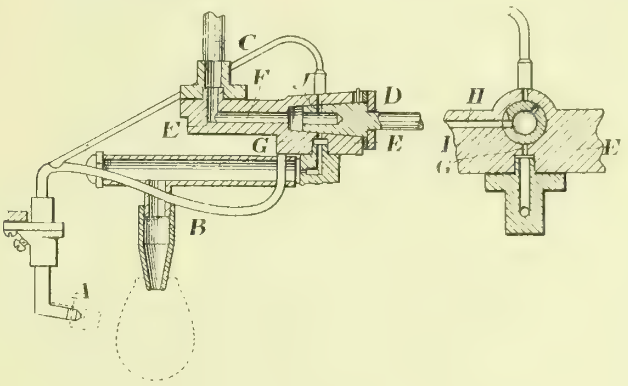
In the arrangement shown in fig. 2, an annular wall G is arranged between the vanes proper C^1 and the lateral parts of the fan C, so that the gas sucked off laterally is again diverted in the direction of the arrows before leaving the apparatus. In this case, the vanes C^1 must be arranged on a disc A and the vanes C upon a disc B, which also carries the rotating disintegrator bars H lying between the fixed bars I. It is preferable to arrange small vanes K about the circumference of this disc B, so as to throw towards the surface E^1 any particles of tar and water which may still remain. Thus the gas is sucked off through the fan C^1 in an almost completely dry and pure state. Water is introduced through an atomizing nozzle inserted through the manhole M. The casing N is preferably made in two parts. The annular disc O, carrying the fixed disintegrator bars I, can then be lifted out with the fan wheel when the upper part of the casing is removed; and this disc can be fastened by a ring P laid within a groove.

Pilot Lights of Gas-Burners.

PEARSON, G. A., of Christchurch, New Zealand.

No. 10,413; April 27, 1914. Convention date, Feb. 11, 1914.

This invention refers more particularly to a pilot light which is adapted to be "flashed" when turning a hollow conical gas-cock, to which the main supply is led, for permitting the supply of gas to the main burner.



Pearson's Gas-Burner Pilot-Light.

A diagrammatic sectional view showing the apparatus, as applied to an inverted burner, is given; also a cross section through the portion in which the gas-cock is mounted.

A is the usual pilot-burner adapted to supply a flame to the mantle for the purpose of igniting the gas at the main burner B—the gas supply for both the main and pilot burners being obtained from a gas-pipe C and controlled by the gas-cock D. E is a distributing casing provided with a tapered bore into which is ground a plug formed with a hollow core in communication with the gas-pipe C by a passage F. Extending outwardly from the bore through the casing are two ports, one of which, G, communicates with the main burner, while the other, H, communicates with the pilot burner. Formed radially through the plug at the required point so as to communicate between the periphery of the plug and the hollow core is a port I, adapted, when the plug is turned into a certain position, to coincide with the port G and place the main burner in communication with the gas-pipe; but when in another position to coincide with the port H and establish communication between the pilot-burner and the gas-pipe. In order that the supply of gas to the pilot-burner may be maintained during the process of turning-on gas to the main burner for a sufficient time to ensure ignition of the latter, a slight groove is formed from the port I for the required distance around the periphery of the plug.

A port is formed through the casing, so as to extend outwardly, and connected with the pilot-burner, and in the plug is formed a port J so positioned that, during the turning on of the gas to the main burner (during the turning of the plug from the position of coincidence of the ports H and I to the position of coincidence of the ports I and G), the port J will provide an additional supply of gas to the pilot burner, with the result that the flame of the latter will be elongated or flashed.

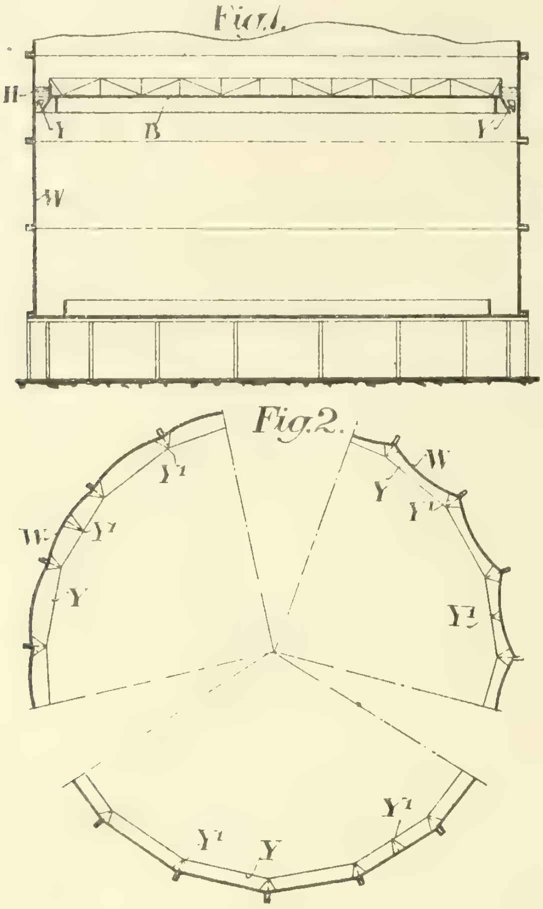
Packing and Sealing Means for Gasholders with Disc-Shaped Crowns.

MASCHINENFABRIK AUGSBURG-NÜRNBERG A. G., of Nuremberg, Germany.

No. 16,473; July 10, 1914. Convention date, Feb. 2, 1914.

This invention relates to gasholders of the type described in patent No. 16,184 of 1914 [*ante*, p. 249], and consists in an improvement in the sealing and packing means employed in connection with the liquid seal there described.

When applying the invention described in the earlier applicatton to gasholders of polygonal section, the sealing and packing members Y are (according to this invention) prismatic in shape; and in order to ensure that an efficient joint or seal is obtained between the ends of the members at the vertical edges or corners of the polygonal gasholder, wedge-shaped or pyramidal packing and sealing members are inserted between the prismatic packing and the sealing members.



A Modified Nuremberg Holder.

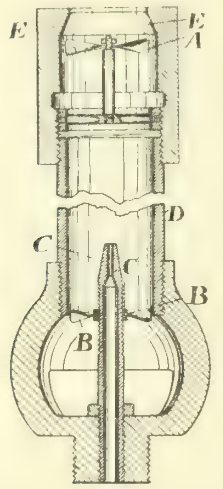
Fig. 1 is a diagrammatic sectional elevation of a holder constructed in accordance with the earlier application to which the present invention is applied. Fig. 2 is a sectional plan view showing the invention applied to three different forms of polygonal holders, in which the different sides of the jacket or shell may either be composed of flat or curved (convex or concave) plates of sheet metal. Between the disc-shaped closing member B and the metal jacket or shell W of the holder, there are arranged in the sealing channel H prismatic sliding-pieces Y similar to those described in the main patent. At the edges there are inserted between every two sliding-pieces Y, a wedge-shaped or pyramidal piece Y^1.

Heating Burners.

Hall, I., of Birmingham.

No. 17,681; July 27, 1914. No. 19,927; Sept. 18, 1914.

This joint invention relates more especially to atmospheric gas-burners of the bunsen type, but is applicable to all burners in which it is desirable that the "fuel" should be efficiently mixed prior to its reaching the end of the burner where combustion takes place.



Hall's Heating Burner.

In carrying the invention into practice as illustrated, the burner is provided with a fan A near the mouth of the burner in combination with a second fan B near the inlet, by which air is admitted to the burner. The latter fan may be rotated by the jet of gas emerging from the gas inlet pipe C—thus "serving to draw in and thoroughly mix the incoming air with the fuel gas." The burner head is adapted to be screwed upon a pipe D, which forms the mixing chamber of an atmospheric burner of the bunsen type.

The lower part of the burner head fits on the pipe; the upper part being plain, and terminating in an inwardly tapering part E, giving a somewhat less area at the point where the fuel issues.

The vane may be of thin sheet metal having radial cuts extending from points equally spaced around its circumference towards its centre—the blades being bent or inclined, and preferably six or eight in number.

The arrangement of the fan A near the combustion point at the end of the burner—either immediately behind a portion of smaller diameter than the general bore of the mixing chamber or in a groove within same—is said not only to mix the gases thoroughly, but also to a large extent prevents lighting-back, and does away with the necessity for employing gauzes in the burner.

The arrangement may be conveniently employed with the gas-burner arrangement described in patent No. 5000 of 1914; and the illustrated form of the gas and air admission member is similar to that described in the earlier specification.

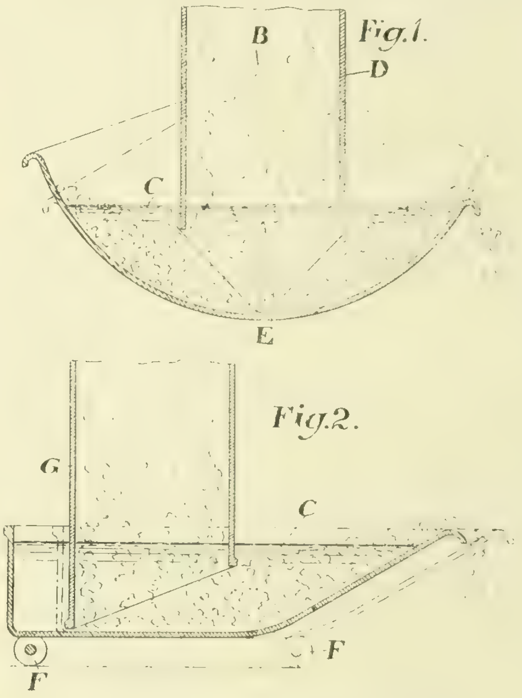
Discharging Continuous Vertical Retorts.

Duckham, A. M'D., of Ashtead, Surrey.

No. 21,191; Oct. 19, 1914.

This invention relates to a method of discharging, through a water seal, a continuously working vertical retort, by "imparting a reciprocating or oscillatory movement to a water-trough which forms the seal and wholly or partially supports the charge of the retort, and in completely or partially preventing the material in the trough from sharing this movement in one direction, so that at each movement some of the material leaves the trough and fresh material descends into the trough."

There are, says the patentee, several manners in which this method may be applied. For instance, the lower end of the retort, or an extension of it, may extend into a water-trough mounted to rock on an axis—there being sufficient room between the end of the retort and the bottom of the trough for the passage of the carbonized material. Beneath the end of the retort there is a stationary plate or the like acting as a scraper in relation to the bottom of the trough. When the trough is oscillated, the carbonized material is carried with it by the movement in one direction and a free space is left between the material and the scraper into which some of the charge in the retort descends; while during the movement in the other direction the scraper prevents the material from moving with the trough, so that some of the material falls over the edge of the latter. By placing the scraper on a line substantially bisecting the discharge opening of the retort, the movement of the trough in each direction becomes effective in discharging the carbonizing material. When the scraper is flush with one side of the retort, in which case it may be an extension of the side or the longer side of an obliquely cut discharge opening, the movement of the trough in one direction only is effective for discharging from the trough. A rectilinear reciprocating movement may be substituted for the oscillatory movement of the trough.



Duckham's Vertical Retort Discharge Trough.

Two forms of the trough into which the lower end of a retort extends, are shown.

In fig. 1, the trough is supported so as to oscillate about the hinge B. D is the lower end of the retort, which extends below the water-seal C. E is a scraper secured to the retort. As the trough is caused to swing to the left (as shown in full lines), the carbonized material is discharged over the right edge; and when the trough is swung to the right (as shown in dotted lines), the material is discharged over the left edge of the trough. Also, at each oscillation some of the charge falls into the trough.

In fig. 2, the trough is adapted to receive a reciprocating motion on the rollers F, instead of an oscillatory motion; and one side G of the retort is extended to act as a scraper. When the trough is moved to the left, some of the carbonized material is discharged over the right edge of the trough, and when to the right some of it will fall from the retort into the trough.

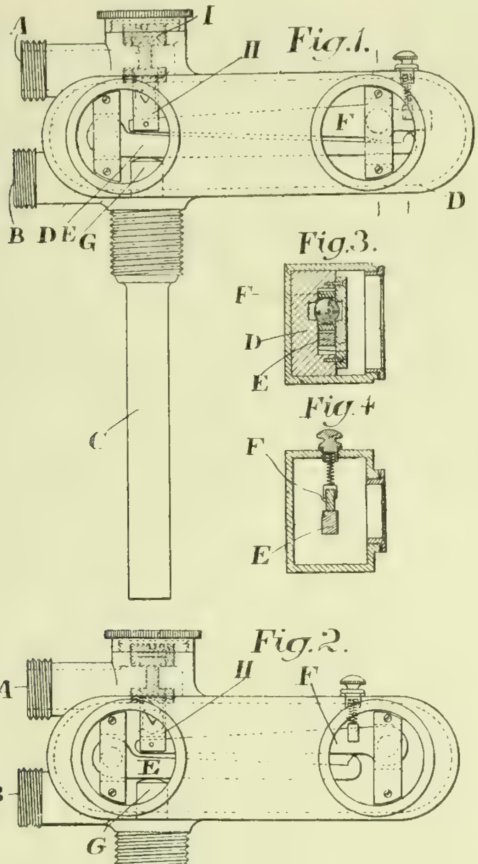
Regulating Temperatures.

Glover, T., of Edmonton.

No. 1927; Feb. 6, 1915.

This invention relates to apparatus for regulating temperatures by determining the flow of gas to burners, of the kind wherein a pair of members having different co-efficients of expansion, and which when exposed to the influence of the temperatures expand at different rates and have action upon a series of levers enclosed within a gas-tight box, to open a valve to determine the flow of gas to the burners. It is characterized in that the levers are supported on ball-bearings, and the gas-tight box enclosing the transmission mechanism is constructed with openings through which the mechanism can be assembled and removed.

Fig. 1 is a side elevation of a complete apparatus with the levers constructed for use when the pair of members having different coefficients of expansion are so constructed that the member having the lesser co-efficient of expansion acts upon the levers. Fig. 2 is a side elevation of the complete apparatus with the levers constructed for use when the pair of members having the different co-efficients of expansion are so constructed that the member having the greater co-efficient of expansion acts upon the lever. Fig. 3 is a section on the line A of fig. 2. Fig 4 is a section on the line B.



Glover's Temperature Regulator.

The gas-tight casing shown has two holes formed in one side, and an inlet A connected with the gas supply and an outlet B connected with the burners. From one side or bottom of the casing projects, at right angles, a tube C (having an opening into the casing) provided with a screw thread near its connection with the casing for ready application to a device in which the heat is to be made constant. Walls D are provided, with recessed portions having flat surfaces on which rests the pivotal parts of the two beams E F, provided at their pivoted parts with holes for receiving balls having a bearing on the edges of the holes in the flat surfaces and held in place by plates, screwed to the walls and having a recess or hole on one surface to engage the balls and hold them and the beams in place.

Both walls and plates are positioned approximately in the manner shown, and the beam E is positioned in the casing with its pivotal point near the rod G, which is contained within the tube C; the position of the rod being such that the beam E always rests upon it at a point somewhere near its pivotal point. The other end of the beam is provided with a knife edge.

The beam F is pivotally connected in the same manner to the other wall; but looks in the reverse direction. At its free end it carries the valve H, which works within a casing screwed into an opening in the main casing and preferably in axial line with the tube C. It has cut away portions for a free passage of gas from the inlet A into the main casing, but controlled by the valve H. A screw cap engaging an extension on the casing allows of inspection and actuation of the valve casing to determine its position with regard to the valve H.

Controlling the beam F is a spring having at one end a saddle encircling the beam; the other end being enclosed in the tubular end of a plug screwed into the main casing, and so keeping the spring in place.

When the apparatus is constructed with the tube C of more expansive properties than the rod G, the beam F is provided with an extension positioned beyond the pivot of the beam; and on this extension is a spring which in normal conditions tends to keep the valve H closed—*i.e.*, within the valve casing, the rod being at its lowermost point. But on the contraction of the tube, due to a fall in temperature, the beam E will be lifted and its knife edge will move the beam F to open the valve—the movement being determined by the contraction of the tube C in accordance with the degree of heat. When the tube is of a lesser expansive effect than the rod G, the beams are constructed as at fig. 2—the spring and knife edge being positioned on the outer side of the pivot of the beam F, and in this case the rod G will, on heat being applied, expand to such a degree that it will be caused to rise, and, in consequence, the beam will rise and close the valve I.

Gas-Workers' Strike Settled.—A strike of Clonmel gas workers for increased wages has been settled on the basis of an all-round increase of 2s. per week.

PARLIAMENTARY INTELLIGENCE.

PRICE OF COAL (LIMITATION) ACT.

The Price of Coal (Limitation) Bill was, as announced in last week's "JOURNAL," amended in various respects [the most important addition being the provision made for contracts] during its passage through the House of Commons. The full text of the Act is given below; and the alterations will be seen on comparing this with the terms of the original Bill, which was set out in the issue for the 20th ult. [p. 137].

LIMITATION OF PRICE OF COAL AT THE PIT'S MOUTH.

1.—(1) Coal at the pit's mouth shall not be sold or offered for sale directly or indirectly by the owner of the coal, or on his behalf, at a price exceeding by more than the standard amount per ton the price of coal of the same description, sold in similar quantities, and under similar conditions affecting the sale, at the pit's mouth at the same coal mine on the corresponding date (or as near thereto as, having regard to the course of business, may be practicable) in the twelve months ended the 30th day of June, 1914 (in this Act referred to as the corresponding price).

(2) The standard amount shall be 4s., provided that the Board of Trade may, by order, if they are satisfied, as respects any class of coal mines specified in the order or the coal mines in any district so specified, that, owing to special circumstances affecting those mines, the standard amount of 4s. should be increased, substitute for that amount such higher sum as they may think just in the circumstances; and as respects those mines, this Act shall have effect as if the higher sum so substituted were the standard amount.

(3) If any person sells or offers for sale any coal in contravention of this section, he shall be liable on summary conviction to a fine not exceeding £100 or, at the discretion of the court, to a fine not exceeding treble the amount by which the sum paid, or payable, for any coal sold by him in contravention of this section exceeds the maximum sum which would have been paid or payable for the coal if there had been no contravention of this section. Provided that a person shall not be liable to a fine under this provision if he shows that he had reasonable grounds to believe that he was not committing an offence.

(4) This section shall apply (both as respects the price at which coal is sold or offered for sale and as respects the corresponding price) to a case where the owner of coal at the pit's mouth has sold or offered to sell that coal at a price which includes the cost of railway or other incidental services besides the actual value of the coal at the pit's mouth, as if he had sold or offered to sell it at the pit's mouth at that price reduced by an amount representing the cost of those services.

(5) It is hereby declared that nothing in this section shall affect the rights or obligations of any person under any contract or agreement for the sale of coal except, in cases where the sale is in contravention of this section, as respects so much of the price as exceeds the maximum price which could have been charged for the coal if there had been no contravention of this section.

LIMITATION OF CHARGE FOR WAGGON HIRE.

2.—(1) Where coal is conveyed from the pit's mouth over any railway in trucks not belonging to a railway company, the seller of such coal shall not be entitled to charge for the use of the trucks any sum exceeding by more than 50 per cent. the sum which the railway company conveying the coal was actually charging for the provision of trucks at the commencement of this Act.

(2) If any person charges or attempts to charge for the use of any trucks in contravention of this section, he shall be liable on summary conviction to a fine not exceeding £100.

DECISION OF QUESTION BY THE BOARD OF TRADE.

3.—(1) If in any proceedings any question is raised as to the corresponding price of any coal, or as to the cost of railway or other incidental services, or as to the sums charged for the use or provision of trucks, the court shall refer the question for determination by the Board of Trade, and the decision of the Board shall be final and conclusive for all purposes.

(2) If for any reason there are not adequate data at any coal mine from which to ascertain, in accordance with the foregoing provisions of this Act, the corresponding price at that mine, the Board of Trade may fix that price having regard to data afforded from sales of coal at other mines.

(3) The Board of Trade may require the owner of any coal mine to furnish such information as appears to them necessary for the purpose of carrying into effect this Act; and if any person refuses to furnish any such information when so required, or furnishes information which is false in any material particular, he shall be liable on summary conviction to a fine not exceeding £100.

(4) The Board of Trade Arbitrations, &c., Act, 1874, shall apply as if this Act were a Special Act within the meaning of the first-mentioned Act.

APPLICATION AND DURATION.

4.—(1) This Act shall not apply to any sale of coal for export, or to any sale of coal for the manufacture of patent fuel for export, or to any sale of coal to be used on any ship.

(2) This Act shall not apply to the sale of coal supplied in pursuance of a contract made before the commencement of this Act:

Provided that, where any contract has been made on or after the 1st day of April, 1915, and before the commencement of this Act, for the sale of coal by the owner thereof at the pit's mouth, coal delivered under that contract after the expiration of the period fixed under this provision, and shown to be excepted coal within the meaning of the provision, shall, if the other party to the contract within two months after the commencement of this Act gives notice in writing to that effect to the owner of the coal at the pit's mouth, be deemed for the purposes of this Act to be sold at the time of the delivery thereof.

If, in consequence of this provision, the price to be paid by any person to whom coal is delivered is reduced by any amount, the price to be paid by any person to whom the coal is delivered in pursuance of any subsidiary contract shall be reduced by an equivalent amount; and any purchaser under any such subsidiary contract shall have the same right to give notice to the owner of the coal at the pit's mouth as the person who has made the original contract with that owner, and any person who has sold the coal shall, if required, communicate to the purchaser the name of the person from whom the coal has been bought.

For the purpose of this provision "excepted coal" means coal supplied for domestic or household purposes to any person and coal supplied for any purpose to any local authority, or to any undertakers supplying gas, water, or electricity in any locality in pursuance of authority given by an Act of Parliament, or by an Order confirmed by, or having the effect of, an Act.

The period fixed under this provision shall be a period of three months after the commencement of this Act, but the owner of the coal at the pit's mouth may apply to the Board of Trade for an extension of that period, and the Board of Trade may, if they are satisfied that there are special reasons in the case in question for such an extension, extend the period for such time as they think just under the circumstances, and the period as so extended shall in such a case be the period fixed under this provision.

(3) This Act shall not apply to coal raised in Ireland.

(4) This Act may be cited as the Price of Coal (Limitation) Act, 1915.

(5) This Act shall have effect during the continuance of the present war and a period of six months thereafter.

LEGAL INTELLIGENCE.

LIABILITY FOR ROAD REPAIR.

Gas Company and Urban District Council.

At a recent sitting of the Dartford County Court, before his Honour Judge PARRY, Mr. H. W. Richards, of Crayford Flour Mills, claimed £33 from the South Suburban Gas Company for damage to a motor lorry. The Erith Urban District Council were sued as third parties.

Witnesses stated that the accident occurred at 5.30 in the morning on Feb. 23, when a motor lorry belonging to the plaintiff sank into a recently filled-in trench in Bedonwell Road, Belvedere. A traction engine had to be procured to haul it out. The material with which the trench was filled was so soft that, in trying to jack the lorry out, the jack and plank themselves sank into it. Another van had gone into the same filled-in trench two days before this accident.

Mr. *S. Y. Shoubridge* (the Company's Engineer) said that since the Company took over the West Kent Gas Company, the work of making-up the roads had been undertaken by the Erith Council. His duty was, as soon as the work was finished, to send in a notice to the Council. It was done in this instance; and the ramming and filling work being completed, the Council were responsible for finishing.

His HONOUR gave judgment for the plaintiff for £25 and costs.

Mr. MORETON SMITH (for the Gas Company) then claimed this sum from the Erith Urban District Council, with whom, he said, they had an arrangement to take over the roads. The Council were responsible for the upkeep of the road; and the softness would have been prevented or overcome if it had been properly rolled. At this special spot it should have had particular attention.

Mr. *Shoubridge* said that, after first filling-in, his Company never did any work; and the Council made a charge in this as in other cases. The trench should have been watched in view of the fact that there was an accumulation of water at the spot in very wet weather. The hole in the road caused by the sinking of the lorry had been made-up by the Council.

Mr. *Benjamin R. Green*, late Consulting Engineer to the West Kent Gas Company, gave evidence as to the existence of the agreement with the Erith Council; and correspondence between the Council and the Company was produced.

Mr. SHAKESPEARE (for the Council) said he had not seen this correspondence; and he asked for an adjournment, which was granted.

At the next sitting, the case of the South Suburban Company against the Council was mentioned as having been settled out of Court.

Damages for Injury by Molten Lead.

An award of £25 was made by his Honour Judge Parry, at the Dartford County Court, in a case in which Eva Crane, of Erith, sued (through her next friend) the South Suburban Gas Company for compensation for injuries received to her foot by the overturning of a ladle of lead while she was playing near her house. It was stated that the child, who was six years of age, was with other children at a spot where the Company had a trench open and some molten lead on a fire. The fire was left unattended, and a boy knocked the lead over on to the girl's foot. His Honour held that the Company were guilty of negligence in leaving a fire unattended while children were playing near.

MISCELLANEOUS NEWS.

THE GAS LIGHT AND COKE COMPANY.

The Half-Yearly Ordinary General Meeting of the Proprietors was held on Friday, at the Chief Offices, Horseferry Road, Westminster—Sir CORBET WOODALL, M.Inst.C.E. (the Governor), in the chair.

The SECRETARY (Mr. Henry Rayner) having read the notice convening the meeting, the seal of the Company was affixed to the Register of Proprietors. The report and accounts (the principal portions of which were given in the "JOURNAL" last week) were taken as read.

THE GOVERNOR'S ADDRESS.

The GOVERNOR: Ladies and gentlemen, in order to understand the present position of our Company and find guidance for the future, we must recollect the state of affairs when I last addressed you, and consider the happenings since then. With the uncertainties and perplexities created by the war, anticipation or forecast has been, and is more than usually, difficult. Therefore, while I address myself to what may probably strike nearly all here as the most important feature of the actual position—viz., the increase in the price of gas which has been made since our last meeting, and its necessary consequence in a further reduction of the stockholders' dividend and the co-partnership bonus—I must deal shortly with a rather wide case.

COAL AND THE FORTUNES OF WAR.

The influence of the war upon the whole range of our operations was very early felt, and precautionary measures were taken without loss of time. In September, the first quarter after the declaration of war, we raised the price of gas from 2s. 6d. to 2s. 8d. per 1000 cubic feet, in order, as I have explained, to meet the enormous increase of East Coast coal freights to London, which rose almost at a bound from 3s. to 13s. and more per ton. We were not caught unprepared so far as ordinary provisions could help us. Our coal was bought up to June this year; and its freightage was, as to a large proportion, arranged for. Had the contracts been duly fulfilled, the small increase in the price of gas would have carried us through; but this was not to be. Deliveries fell more and more into arrear, so, powerless to obtain our due supplies, we were constrained to replenish our vanishing stocks by purchasing such coal as we could at extravagant prices, with freights conforming. I am not seeking to put the blame for our trouble on anybody. What happened was the fortune of war. We, at any rate, discovered that it was impossible to carry on business upon ordinary lines, trusting to the making of contracts at the usual time. In March, the outlook had grown very black. Our stocks of coal were reduced to a few days' supply. The first requisite was tonnage to bring home enough coal to go on with; so we bought certain steamships, knowing that with these we should do much more economically than by paying 13s. 6d. to 15s. for outside boats, and 12s. per ton for boats let out by the Government. As I remarked at the time, these rates were sadly inflated, to the detriment of all home coal consumers. This we have proved by our experience in running our own boats. Those we bought during the winter could hardly be called cheap, as might be supposed, either in first cost or in running; yet for the half year the total cost of running them has varied from 4s. 5d. to 3s. 2d. per ton carried, including allowances for interest and depreciation. I need hardly say that the purchase has proved a very advantageous one for the Company. The matter of tonnage being dealt with, there remained the more portentous questions of the probable much higher cost of coal for the period 1915-16, and the certain increase in the cost of all other consumables and materials. The second important raw material of our manufacture is oil. The price of this had already gone up in sympathy with coal, and we knew we should be faced with more demands on war account than we were able to foresee. It was further impossible to take credit for the usual increase in the quantity of gas consumed.

FINANCIAL POSITION AND THE PRICE OF GAS.

A careful estimate of the financial prospect then made showed, as the fundamental data of the actual situation, that of the credit balance of profit and loss which had been accumulated between 1906 and 1912, amounting to close upon £770,000, nearly £400,000 had been reabsorbed up to the end of last year. The estimated deficit, assuming no further increase of revenue, was £450,000 for the year. This eventuality left the Board no alternative. They were reluctantly driven to raise the price of gas to the bare sufficiency, when coupled with the consequent sacrifices by stockholders and co-partners, to square the account—that is to say, the deficit was, apart from other considerations, considerably more than the £450,000; and the increase was supplemented by the saving in dividend and the saving in bonus. Knowing how very heavy would be the loss on the year from June, 1915, to June, 1916, they did not care to reduce the balance in hand by £100,000, which would have happened had no further addition been made to the price. I may point out that this balance forms an important part of the Company's working capital. Any further shrinkage of this cash reserve, therefore, makes a corresponding inroad on the fund out of which we pay our way, which it is our habit to do, very promptly, thereby deriving the customary advantages of the prompt payer, which I am sure you would wish to preserve. This explanation, I trust, sufficiently clears up the situation as presented in March. Perhaps it may be a satisfaction to hear that there eventuated several circumstances pointing to some adjustment and relief of the arduous conditions prevailing at that time.

THE OUTLOOK FOR COAL.

The period under review—and it will be the same with the current half year—has not been saddled with the full burden of war prices, for the reason that, as already stated, the deliveries of coal under pre-war contracts fell into arrear, and have been gradually working off. We now have good—indeed, abundant—stocks of coal at our several works. As the result of Government action in the two respects of regulating exports of coal and limiting the pit-head price, the home supply of this necessary of our industry is rendered more abundant. At the same time freights have fallen to one-half what they were; while the threat of famine prices has been repressed. True, the authorized increase of 4s. per ton upon last year's pit-head prices will mean to us an increased working expense of about £350,000 a year; but it will bring the satisfaction of showing clearly where we are, so enabling our estimates to be framed with greater confidence.

RESIDUALS AND GAS SALES.

Residuals are improving; but, on the other hand, the sales of gas are down. On the whole, not forgetting that everything we buy is dear, and will probably become dearer, the circumstances of our having not only balanced our revenue account but for the first time in three years added to the amount carried forward, indicates that our policy of caution has met the emergency for the time being. I entertain the hope that the present price of gas may not continue to be necessary for any long period.

THE ACCOUNTS.

The accounts contain many satisfactory elements. The balance of unspent capital is larger; expenditure having been £53,300 and depreciation £97,000. In addition, we have withdrawn £12,000 from the depreciation fund (No. 10) and written-off from capital the value of a holder abandoned some time ago when the Page Street station was discontinued. Increased yield of gas per ton of coal has saved over 40,000 tons, and a consequent expenditure of £39,000. The rental derived from meters and stoves on hire continues to grow, thus proving that gas is still rising in public favour. This entry in our accounts helps to justify the confidence I expressed at our last meeting in the essential permanence in the elements of our affairs which makes for stability and prosperity, and will, in due time, bear fruits of increase.

The output of gas has been adversely affected by the continuation of the official lighting restrictions, which have taken the form of earlier closing of public houses, abolition of outside lights, and a great reduction in the number of public lamps in lighting. These restrictions lead probably to earlier hours being kept generally. The output in consequence shows a decrease of 4·31 per cent. as compared with the quantity sold in the corresponding period of 1914. The gas-rental shows an increase of £130,791, allowing for the decreased output.

The revenue for residual products shows a decrease of £110,617. Except in the case of tar and liquor, where there is a small reduction in the value per gallon, the whole of this reduction is due to the smaller quantity of coal gas manufactured as a result of the decrease in business, and of the substitution during the latter part of the winter of a greater quantity of oil gas for coal gas. Early in the year it became necessary to conserve by all means the coal obtainable; and with this aim the percentage of oil gas was raised from about 25 per cent. to 40 per cent., with the result that much less coke was produced. In the process of manufacturing gas from oil, not only is no coke produced, but a large quantity is actually consumed. The substitution of oil gas for coal gas will be found to colour the whole of the Company's accounts during the half year under review.

On the debit side of the account you will see there has been a decrease of £75,186 in the cost of coal and freight, notwithstanding the fact that there has been an increase in the price of both coal and carriage. This is due to the smaller quantity of coal carbonized. As might be expected, owing to the large increase in the quantity of oil gas manufactured, the cost of oil shows an increase of £20,825.

Dealing now with the Company's working during the half year under review. There has been a decrease in manufactory wages of £8300, due partly to the improved make of gas per ton of coal and partly to the substitution of carburetted water gas for coal gas. There is a decrease of £9700 under co-partnership—the bonus, owing to the rise in the price of gas, being at the rate of 3¼ per cent. instead of 5 per cent. Of this 3¼ per cent., it is gratifying to know that the co-partners have voluntarily set aside 1¼ per cent. towards the war distress fund which has been instituted by the employees for helping the relations of men who may unfortunately fall during the war, or assisting in cases where men are incapacitated for further work. [Hear, hear.] This sum amounts to £11,520, and is administered by a Committee of the employees of the Company.

Distribution of gas shows a net reduction in cost of £9664. Under the heading of law and parliamentary, there has been a decrease of £2977, as the Company have incurred practically no expenditure on parliamentary work during the half year. Bad debts show an increase of £2037. Last year was the lowest on record since 1905. We have not been able to live-up to this high level, chiefly owing to the number of consumers who are suffering from the effects of the war. Workmen's compensation shows a decrease of £1695, which is satisfactory from the point of view of both the employees and the Company.

EMPLOYEES AND THE WAR.

The Directors are continuing the Company's allowances to their employees on active service who have dependants. These allowances amount to £7000 for the half year. There are now 2200 men serving with His Majesty's Forces, and I regret to say that there have been a good many casualties, more especially in the regiment which the Company's men have so largely joined—viz., "The Rangers"—which has distinguished itself greatly in France. I am sure it will be the wish of the shareholders to convey their sincere sympathies to the relatives of those men who have fallen fighting so gallantly. [Hear, hear.] There has been a decrease in cost of National Insurance for the half year of £643. This small reduction is due to the fact that the contributions of those employees on Active Service are now paid by the Government.

INVESTMENTS AND THE WAR LOAN.

Among their investments, the Company have a sum of £221,000 Consols standing to their credit at a book value of 75 per cent. In view of the depreciation they have suffered, it was thought wise to write them down to 66⅔—the figure at which, on conditions, they can be converted into the new War Loan. This writing-down has cost some £18,000. With the assistance of the Company's bankers, arrangements have been made to convert the net amount into War Loan, and the result will be a considerable increase in the yield of interest on this investment. While on this subject of the new War Loan, I may say that the Directors have taken steps to enable the Company's employees to obtain small allotments of the loan on an instalment system; and it is satisfactory to be able to state that a large and increasing number of men are availing themselves of the facilities offered them. [Hear, hear.]

DIVISIBLE PROFIT.

The financial result of the half year is that, after providing for fixed charges, and setting aside £5000 towards the redemption fund, there remains a profit balance of £395,050 13s. 11d. The amount brought forward from the previous half year being £384,538 3s. 10d., there is a total available balance of £779,588 17s. 9d., out of which the Directors recommend the payment of a dividend upon the ordinary stock at the rate of £4 4s. per cent. per annum, which will absorb £343,501 6s. 1d. That the Company's business is still going forward is proved by the fact that there has been an increase of 1679 in the number of consumers during the last half year, and of 16,600 in the number of gas-stoves sold and let on hire.

LOSS OF THE S.S. "FULGENS."

Since these notes were written, we have heard of the loss of our good ship "Fulgens," which was torpedoed by a German submarine off the Norfolk coast. Fortunately, all the members of the crew were saved, though one was seriously injured. This is a grave loss to us. The "Fulgens" was an admirable ship, and carried for us about 200,000 tons of coal annually. She was, of course, insured, as was also her cargo. That the war is being conducted by the enemy on cowardly and contemptible lines, all the world knows. In this case, although no warning was given, and no effort made to help the crew, we have no more right to complain than very many others who have fared likewise.

WAR MUNITIONS.

The manufacture of materials for high explosives is proceeding satisfactorily and in increasing quantities at most of our stations. The Directors have also placed at the disposition of the Munitions Committee a number of workshops and tools for the manufacture of shells; and our mechanics are taking up the work with enthusiasm. Here, again, we find that men incapable themselves of bearing arms can yet serve the country well and aid our fighting men to bring the war to a victorious close. We are not only making shells, and the charges for them, but we, and companies like ours, are maintaining an industry of the greatest importance to the nation, and which contributes in no small measure to the vast sum which the war demands.

Adoption of the Report and Accounts.

The Governor: I have pleasure in moving:

> "That this meeting do agree with, and confirm, the report of the Directors and the Auditors' report and statement of the accounts of the Company as transmitted to the proprietors on the 29th ult."

Before putting the resolution to the meeting, I shall be happy to hear any remarks which proprietors may wish to make and to endeavour to answer any questions they may ask.

The Deputy-Governor (Mr. John Miles): I beg to second the motion.

The Governor: As no one has any observations to make, I will put the resolution to the meeting.

The motion was put, and carried unanimously.

The Dividend.

The Governor: I will now ask the Secretary to read the minute with regard to the dividend.

The Secretary read from the Directors' minutes the following:—

> Resolved: That it be recommended to the half-yearly ordinary general meeting of proprietors to be held on the 6th prox.:
>
> (1) That dividends as follows for the half year ending the 30th June last be declared—viz.:
>
> On the 4 per cent. consolidated preference stock at the rate of £4 per cent. per annum;
>
> On the 3½ per cent. maximum stock at the rate of £3 10s. per cent. per annum;
>
> subject to deduction of income-tax.
>
> (2) That, out of the divisible profits for the said half year remaining after the payment of the foregoing dividends, the sum of £5000 be set aside towards the redemption fund, in accordance with the provisions of the Company's Act of 1903.
>
> (3) That, out of the balance of divisible profits amounting to £779,588 17s. 9d., and applicable to dividend on the ordinary stock, the sum of £343,530 6s. 1d. be set apart for the payment of dividend for the said half year on the ordinary stock of the Company, and that such sum be appropriated in payment to the proprietors of ordinary stock of a dividend for the said half year at the rate of £4 4s. per cent. per annum, subject to deduction of income-tax, and in payment of forfeitures incurred, amounting to £29.

The Governor: I have much pleasure in moving the resolution.

The Deputy-Governor seconded the motion, and it was carried unanimously.

The Governor: That completes the business of this morning.

Votes of Thanks.

Mr. Thomas Gardner said he felt sure the shareholders would not like to part without thanking the Governor, Directors, officers, and staff of the Company for the great services which they had rendered during the most trying half year through which they had lately passed. After listening to the very interesting and clear speech of the Governor, he felt perfectly certain that everyone connected with the Company must have had an exceedingly anxious time; and he feared they must still look forward with some anxiety to the future. They were all pleased to hear the Governor express a hope that it might not be necessary to continue the high price of gas. He trusted that this would be so, in which event they might look forward to a slightly increased dividend. Whether this was so or not, he was sure he voiced the feelings of all present in saying it was a source of satisfaction to them that the management was in such experienced and capable hands, and that they could look forward to the wise management of the Company in future. He moved that a hearty vote of thanks be accorded to the Governor, the Directors, officers, and staff of the Company for the valuable services rendered during the past half year.

Mr. W. Brown, in seconding, said the mover of the resolution had made an exhaustive speech; but as he (the speaker) had come a long way to the meeting, he might be allowed to say that he was very pleased with the speech which the Governor had made, and the speech made in eulogy of the able management of the Company. It was very nice to attend the meeting and hear that in these critical times their interests had been so well looked after, and that they could look forward with confidence to the future.

Mr. W. Dunkley supported the motion, and suggested that notice should be taken of the patriotic action of the Directors in allowing the men to go to the Front and for the care which was being taken of their families. The Board had done what he was sure the shareholders would approve. Therefore he suggested the addition to the resolution.

Mr. Gardner said he should be very glad to incorporate the suggestion in his motion.

The resolution was unanimously adopted.

The Governor's Reply.

The Governor: Mr. Gardner, ladies, and gentlemen, we have been used to votes of thanks for a good many years now; but I do not think that ever in the history of the Company did a vote come with more satisfaction to those who sit on this side of the table than it does on the present occasion. We have gone through the most anxious and trying times that have ever fallen to the lot of this Board; and the result of it has been felt most keenly, as we were all of one mind in our desire to avoid an increase in the price of gas. To have to do this was to us a very painful necessity. But to find to-day in this large gathering of shareholders that there is not a word of disapproval of the action of the Board, but evidently a feeling of approval, is a great help. Mr. Gardner spoke of the anxieties of the Board. I can assure you our greatest anxiety is to hasten the time when the increase in price will be diminished, if not wiped out. The honourable proprietor on my left, who spoke about the patriotic action of the Board, has not forgotten the fact that he is responsible, as you all are, for that action. because on the last occasion you approved the action of the Directors. As the vote includes the officers, staff, and workmen, I may repeat what I have said already—that the mechanics are looking forward with enthusiasm to taking their part (which must be done in hours after the day's work is finished) in helping the War Department in its work. With all the staff there is a spirit of contentment and a desire to do the best they can. For the staff it has been as trying a time as it has been to the Directors during the past six months, and every one has risen in the most excellent manner to the needs of the occasion.

Reply on Behalf of the Staff.

Mr. D. Milne Watson (the General Manager), on behalf of the staff, thanked the meeting for the kind manner in which they had passed the vote of thanks.

COMMERCIAL GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. G. Bradshaw in the chair.

The Secretary (Mr. F. J. Bradfield) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

Difficulties and Anxieties of War Times.

The Chairman: Ladies and gentlemen, I have to move—"That the report and accounts now submitted be received and adopted, and entered upon the minutes." The period covered by the report and accounts which we now present to you is the second half year under war conditions. Therefore you will understand that we have had to meet many unusual difficulties and hindrances in our working, such as a reduced staff, shortage of labour, delays of transport, extra wages and allowances to our employees, and an increase in the cost of nearly all the materials we use in making gas, including coal and oil. Yet, I think, if you have studied the accounts, you will agree with me that the results are better than might have been expected, and they certainly are not unfavourable.

LOWEST PRICE OF THE THREE LONDON COMPANIES.

The feature of the half year is the fact that, in common with other companies, we have had to raise the price of gas—not, we are happy to say, to an extent which could damage the trade of the district or inflict serious hardship on the consumers. But still it is always a grief to the Board when we have to raise the price of gas at all. As you have seen, we had to increase the price from 2s. 4d. per 1000 cubic feet to 2s. 8d. as from the Lady-day quarter; and this means a reduction in dividend at the rate of 10s. 8d. per cent. on the 4 per cent. stock and 13s. 4d. per cent. on the 3½ per cent. stock, and a loss of bonus to the workmen, under the profit-sharing scheme, of 2 per cent. on the wages. In this way, we all—stockholders, consumers, and employees—share the burden of the times in which we live. We are not alone in having to raise the price of gas. The Gaslight and Coke Company have had to increase their price by 8d., to 3s. per 1000 cubic feet; and the South Metropolitan Company have raised their price first by 2d., and then by 6d., to 2s. 10d. per 1000 cubic feet. Only having to raise our price 4d. has brought about the abnormal position that we are now selling gas cheaper than any of the three Metropolitan Companies.

THE VALUE OF SHIP-OWNING.

This is due to the fact that we possess our own ships; and therefore we have not been penalized to the same extent as other companies by the extraordinary rise in freights from the North which took place at the end of last year and the beginning of this. You will remember perhaps that, at our last meeting, I explained to you that freights from the Tyne to the Thames which normally stand at about 3s. per ton, rose to 13s. 6d. per ton; and I believe 14s. was actually paid. Even now when the Government have done something to alleviate the situation, one cannot charter a ship to bring coals from Newcastle to London under 7s. or 7s. 6d. per ton. Although we have our own ships, and have benefited largely by this, yet they have not been running nearly so efficiently and economically as in other days, because the boats are subjected to all sorts of delays, arising from Admiralty regulations, the putting out of lights in the North Sea, and so forth. Nevertheless, the cost of bringing coal from the North, I am happy to say, has only gone up to us by 1s. 4d. per ton above the price at which it stood this time last year—that is, the first six months of 1914—when we were working under peace conditions. I think that this is a very remarkable and satisfactory fact; and it is in spite of our having chartered three extra steamers at a high market rate so as to improve our stock of coal, which was very much depleted at the end of the winter. No doubt you have seen from the capital account that the high freights have induced us to purchase another steamer. The four we had were not in ordinary times sufficient to bring the whole of our requirements to London; and so we used to rely upon being able to charter ships at cheap rates. This was very well then. But now that freights have gone up so much, we decided that we must get another steamer, so that we might be able to carry all our supplies. After some considerable difficulty, we found a steamer of about 900 tons burthen, which is the largest size which will lie alongside our wharf at Wapping. She has been connected with the west coast coal trade, and has proved quite suited to our needs. Of course, we had to pay considerably more for her than we should have paid in peace times; but we have done what I think was a proper thing—we have written-down the cost of the ship to her value under ordinary conditions. That is the price at which she stands in our books to-day; and I am glad to be able to say that, before the year is out, we shall have about saved the cost of writing-down the ship. We have now more than sufficient shipping to carry all our requirements in the way of coals; and this will enable our Engineer to increase and to maintain our coal stock. Although, as I say, the stock was much depleted at the end of last winter, we have succeeded in getting it up to the normal amount at this time of the year; and we are straining every nerve to begin the winter with a much larger supply than usual. Of course, although our ships render us independent of the high market rates for freights, still we have to face the anxiety of the perils of the North Sea, and all the delays and hindrances which come from the condition of war. It is reassuring that the Government have at last taken steps to put restrictions on the export of coal and coke. You will have noticed from yesterday's "Times" that the exportation of coal and coke will be prohibited as from Aug. 13 to all destinations abroad, except British Possessions and Protectorates, other than by licence of the Board of Trade.

RAW MATERIALS AND RESIDUALS.

Another cause which forced us to raise the price of gas was the increase, which I have previously mentioned, of the prices of raw materials. This increase was not offset, as is usually the case, by an enhanced return from the sales of residuals. If you compare the amounts received from residual products in the past half year with those realized in the corresponding half of 1914, you will see that in the past half year we actually obtained £370 less. Coke gave us more by £1969; but this does not represent the true market value of coke. I believe I mentioned the last time we had the pleasure of meeting you that our principal coke contracts fell due for renewal before the large rise in price took place, so we are not deriving the full value of the rise in market value at the present time. Tar and sulphate of ammonia sold at lower prices, and yielded £2411 less. Still the prospects for the residuals markets are very good. Coke has risen in price; and the demand for it is greater than we can comply with. Both tar and sulphate are also now selling at good prices.

WAR ALLOWANCES.

Another reason for the necessity of raising the price of gas is the special war allowance, owing to the increased cost of living, to our employees earning less than a certain amount. It is a vital necessity of our business that we should keep our workpeople contented and happy; and this, I am glad to say, we succeed in doing. The special war allowance amounts to 4s. a week and downwards according to the circumstances of the workman, and the number of those dependent on his earnings. I may say that the seamen and firemen on our ships are now receiving double the wages they were getting prior to the war. The extra cost to the Company of these allowances during the half year was £4577, of which the crews of the ships received £2065. In addition, we have also given a proportion of their salaries and wages to those members of our staff and the workmen employees who have joined His Majesty's forces; and this has cost £1797 in the half year. So that, under these two heads, we have had to spend £6375 in the six months over and above our usual requirements. Beyond this, the depletion of our staff has added considerably to the difficulties of carrying on our business.

NEW CONTRACTS—COAL PRICES LIMITATION ACT.

Since we met you in February last, we have completed the new annual contracts for the purchase of coal and oil, and you will not be surprised to hear at a greatly increased cost, and this in spite of the fact that we were in the market before the principal increase in prices took place. Our coals have cost no less than 3s. 1d. per ton, f.o.b. in the North, more than in the preceding year; and this represents an extra charge of about £30,000. Oil (of which we use between 2½ and 3 million gallons a year) has cost us ¾d. per gallon more; and this is equivalent to something like £9000. These two items therefore amount to £39,000. From the figures I have given you I think you will see that the rise in the price of gas was forced upon us. I should like to point out that during the half year to June last, we were working under our old contracts; and therefore the coal and oil used was at the lower rates, so that the present accounts do not show any sign of the rise. You are probably all acquainted with the provisions of the Price of Coal (Limitation) Act, which fixes the price of coal at the pit mouth (subject to certain exceptions) at not more than 4s. per ton above the price of similar coal sold under similar conditions in the twelve months ending June 30, 1914. Of course, some such measure and regulation were absolutely necessary in order to keep down the price of coal. But I cannot help feeling that the Act gives the coalowner a liberal margin of profit; and I am afraid one result will be to level-up the price of coal to the maximum fixed by the Act.

INCREASED CONSUMPTION AND CONNECTIONS.

One very satisfactory feature of the half year is that, in spite of all the restrictions placed on public lighting, our business has increased in volume. We have sold 38½ million cubic feet more gas during the half year than in the corresponding period of 1914, which is equivalent to an increase of 2¼ per cent. on our business. We have connected-up 81 new ordinary consumers, 695 new prepayment consumers, and a rather larger number than usual of stoves—2922. This increase is largely due to the industrial activity in our neighbourhood, and to the high price charged for coal for domestic use, which has driven the small buyer of coal to consume gas instead of coal.

HELPING THE COUNTRY.

Now you will like to know what we are doing to help our country in this hour of need. Tar is, as you know, one of the principal bye-products of the carbonization of coal; and tar in the hands of the chemist is a regular Pandora's box, full of valuable substances—such as ammonia, benzol, toluene, naphtha, carbolic acid, cresylic acid, creosote, anthracene, naphthalene, pitch, and some other things which I do not recollect. These substances in the hands of the chemist are converted into other substances. For instance, carbolic acid treated with nitric acid forms picric acid, which is an ingredient in the manufacture of high explosives. Toluene becomes toluol, which is the basis of trinitrotoluol; and this is one of the most powerful explosives known. You will see from this that it is of vital importance that the Government of the country should have as much toluol as is needed. Now Mr. Charles Carpenter, D.Sc., the able Chairman of the South Metropolitan Gas Company, invented a very simple process, whereby the amount of toluene in the tar could be enlarged twelve to fourteen times. We have installed the process at our works; and we are now supplying with this enriched tar the tar distillers who extract the toluene. This is one way in which we are helping the Government. We have also taken steps to supply the Government with concentrated sulphuric acid which is another ingredient in the manufacture of explosives; and as soon as we get the necessary machinery, we are going to commence the manufacture of fuses for shells. Beyond this we have released our able Assistant Engineer, Mr. Gill, from some part of his duties to the Company, in order that he may become District-Manager to the Munitions Committee; and he is doing splendid service in organizing the East-end of London for the production of munitions of war. Then our Chief Engineer (Mr. Stanley H. Jones) has instituted classes for the instruction in mechanics of our staff and others after business hours, in order that they may be able to take the place of those mechanics who are called away on the country's service, or at any rate help those left behind. In these and other ways, we are doing all we can to assist our country at this crisis.

DEPRECIATION OF INVESTMENTS.

There is one matter I think I ought to bring before you. You are, of course, aware that the war has depreciated the value of nearly all securities; and our investments, which represent our insurance fund and in part our reserve fund, have, being all gilt-edged, suffered severely. We have taken steps to convert the small amount of Consols we hold into the new War Loan; and we have under consideration the writing-down of the remaining investments to their respective minimum prices.

FEATURES OF THE ACCOUNTS.

Now if you turn to the accounts for one minute, I will give you a bird's eye view of the financial aspects of the half year. I have already alluded to the purchase of another ship; and the happy results in economy and efficiency which have followed from this. I have alluded to the fact of the large number of stoves which we have fixed during the half year. Now if you turn to the revenue account, you will see, by comparison with the first half of last year, that gas gave us £13,527 more, due to the higher price, which was only charged the last three months, which, being summer months, gave the additional revenue over a comparatively small consumption of gas. Extra profit was also obtained because we sold 38 million cubic feet more gas. Then meter-rents yielded an additional £1841. Residuals produced £370 less; and miscellaneous receipts were £95 less. Therefore, altogether, we have a net increase in income of £14,903. On the expenditure side of the account, we have spent more by only £1689; so that our profit is £13,214 more than this time last year. On that occasion we were £13,949 short of our statutory dividend and interest. This half year, after paying interest and dividend (which I may remind you is £5900 less than it was for the corresponding half year, owing to the increase in the price of gas), we shall increase the surplus by £4374. I think this is satisfactory under the conditions prevailing.

IN THE COUNTRY'S SERVICE.

Now, before I sit down, I should like to say that nearly 200 of our employees have joined His Majesty's forces, and already five have laid down their lives in their country's service. I am sure we shall ever hold their memories in gratitude and honour; and our heartfelt sympathy is with their bereaved relatives.

WILLING WORK.

Our workmen have done extremely well. The Engineer informs us that the work has been excellent in every way, and that our relationships with the men have been all that could be desired. They have continued the very trying work of guarding our stations by night as well as by day. This work has been done very satisfactorily; and it has involved the loss of a good many nights' rest. This sacrifice, however, has been cheerfully borne. Of course, when the price of gas was raised, we had to alter the whole of our coin-meters, so that they would pass a less quantity of gas per penny. This involved dealing with more than 90,000 meters; but the work was done in a very few weeks, and at very small cost—only 2½d. per meter. I mention this because I think it reflects the greatest credit on the outdoor staff.

KNOWN FACTORS AND THE FUTURE.

During the current half year, we are paying for our coal and oil an increased price under the new contracts. Although we may look for a better return from our residual products than during the last six months, still we must expect reduced profits. Our chief anxiety as we look forward is the supply of coal during the winter months. But I have explained to you what we have done to meet this; and I think you will agree with me that we have taken all steps in our power to ensure the maintenance of the supply. In these times I dare not prophesy; but I may express the hope that nothing will interfere with the continued prosperity of the Company.

The Deputy-Chairman (Mr. H. E. Jones) seconded the motion.

Mr. George Ennis said there was only one point in the Chairman's observations to which he wished to allude—that was, the proposal to write-down the reserve fund to the present depreciated value of the investments. To his mind, in very many cases this was a great mistake. He mentioned this now because the Board had not yet done what they proposed to do. Their reserve fund was something like £75,000; and he thought it would be better to put the words "at cost" against the investments, and place against that the depreciation. In his opinion, this was the most reasonable way to treat the matter, as then they did not lose sight of the cost of the reserve. He congratulated the Directors generally upon the way in which they had fought the Company's battle through the war times. They had presented an admirable account—one which was satisfactory to the proprietors in every possible way. Not only the Directors, but the staff deserved to be complimented upon the manner they had fought a way for the Company through this very difficult period.

The Chairman thanked Mr. Ennis for his remarks. With regard to the writing-down of the investments, he (the Chairman) had said what he did in his speech because he rather thought that Sir Alfred Bateman, the Official Auditor, wished him to do so. The whole thing was as broad as it was long. As the proprietors knew, the Directors had in past years written-down the investments; and they would bear in mind what Mr. Ennis had said.

Mr. Ennis: The reverse operation is very difficult now.

The Chairman: The reverse is never done.

The motion was unanimously passed.

The Dividends.

Moved by the Chairman, and seconded by the Deputy-Chairman, the statutory dividends were declared at the rates of £4 18s. 8d. per cent. per annum upon the 4 per cent. stock, and of £4 13s. 4d. per cent. per annum upon the 3½ per cent. stock, both less income-tax, and payable on Aug. 16.

Votes of Thanks.

Mr. Ennis moved a vote of thanks to the Chairman and Directors for their conduct of the affairs of the Company during a very trying half year.

Mr. M'Naught seconded the motion.

The Chairman heartily thanked the proprietors for their vote, assuring them that his colleagues and himself did not look upon this acknowledgment as a formal thing. They valued the good opinion of the proprietors, and appreciated their thanks half year by half year. Might he now pay honour to those to whom honour was especially due, by moving a vote of thanks to their officers, the staff, and the employees. He had already alluded to the good work done by their employees. He had, in company with one of his colleagues, the pleasure of meeting the Profit-Sharing Committee the previous week, together with the chief officers of the Company, and they had a very pleasant meeting. Of course, all present were aware that the war had brought extraordinary prosperity to the working classes of the country. Work was plentiful, and wages were high. But what was going to happen after the war was over? He feared that then work would not be as plentiful, nor would wages be as high. So while all was pleasant and easy now, he for one anticipated that they would have economic troubles in future. The Directors would then find the need of what they had now; and they believed they would then have a full continuance of the mutual confidence between employers and employees. He should like to specially mention the officers and staff of the Company, because they had been working short-handed. They had had many extra difficulties and anxieties; and they had faced them with courage and patience. They owed to them not only a vote of thanks, but sympathy in their difficulties, and the assurance that Directors and proprietors stood behind them through thick and thin.

Importance of the Gas Industry in the War.

The Deputy-Chairman, in seconding, said he could not pass by this motion in silence. This had been a time of hard work and anxiety for the Directors, and especially had it been a time of harassing work for the officers and their staffs. They had brought the trading of the Company, under all the difficulties and extraordinary circumstances, to a good conclusion. If the proprietors noticed what fell from the Chairman, they would have observed that the Company had now accomplished that which was his proud aim for many years when he was the Company's Chief Engineer—that was, to supply gas at the lowest price of any of the three Metropolitan Gas Companies. When the proprietors remembered that this was the smallest of the three Companies, and that two of the Company's works were remote from the river traffic, they would realize that this was indeed a very proud position, and reflected great credit upon the staff. The Chairman had alluded to the future, and gave him the key to say something that he wanted to say. This war, great adversity as it was, had taught many people some very important things in connection with gas. The Chairman had touched on the great importance of gas-works products in the manufacture of explosives. Not only was the highest explosive of all, "T.N.T.," to be got only from gas-works, or works carbonizing coal, unless it was by a very complicated and almost commercially impracticable system of synthetically building-up, but they made also the lower explosives—phenol and picric acid. They had also a great demand for sulphuric acid, which was obtained from one of the impurities removed from gas. From this the acid could be made very free from arsenic, while that made from the pyrites deposits of Spain contained arsenic in considerable quantity. But a good deal of this bad acid had been made, and much injury had been done by its use. These were some of the ways in which gas had helped in the war. The war had also taught the consumers of gas how to avoid the high prices of coal by turning a little more gas into their domestic arrangements—into their cooking-stoves and other appliances which the Company let out to them. The Company had no less than 75,000 working men consumers, who wanted cheap gas; and they also had a large number of manufacturers in their area. The war had taught the manufacturers, and even their friends the electric light people, the enormous advantage of having a good supply of coke in their midst. Coke, as he had said somewhere else, was not produced purposely to make a profit, but they perforce had to produce it so long as they made gas. This was very important to the users of solid fuel. Not less important was the realization of the fact by the Government authorities that it was wise to give gas companies as much coal as they wanted at a reasonable price, because naturally, under the sliding-scale, the greater part of all that was saved by the reduction of the price of coal went directly into the pockets of the poor consumers of gas. It had been calculated by the "Journal of Gas Lighting" that £828,843 a year—nearly 1 million of money—was the additional cost that fell upon the consumers of gas supplied by statutory undertakings by an increase of 1d. per 1000 cubic feet; and this was practically what every increase of 1s. per ton on the price of coal represented to the consumers. It was really due to the gas interests who had been hammering away at the authorities, and to the convincing case put forward by the gas and electric light people, and other large buyers of coal for public services, that the Government were bound, and were led, to restrict the export of coal, and so enable their own community to be properly served. It was a matter of great interest that, in the recent debate on coal prices, the President of the Board of Trade (Mr. Runciman), in speaking about the position of gas companies in relation to the price of coal, pointed out to the House that any savings that they could effect went in greatest part to the public represented by the consumers of gas. It was a fine thing for a Government authority to have learned this, because he (Mr. Jones), in giving evidence before many Parliamentary Committees, had found it difficult to get the members to really understand the operation of the sliding-scale, under which, if the price of coal were raised unduly, the coalowners simply made gas undertakings the collectors of the extra tax put upon the consumers of gas.

The motion was heartily agreed to.

Mr. Stanley H. Jones (Engineer and General Manager), on behalf of the engineering and managing staff, thanked the proprietors for the kind recognition that had been made regarding their services. The half year had been a very stressful one for the staff of any gas undertaking. He knew of cases where officers had physically broken down through the strain; but he was happy to say that the staff of the Commercial Gas Company happened to be a rather young and sturdy one; and he thought they would be able to face the thing through, so long as it was necessary. Special thanks were due to the men who ran the Company's steamers through those long dark nights of last winter, with all sorts of natural as well as artificial dangers facing them. What they had done had been simply splendid. Merely as an example of the risks run by the mercantile service, he might mention that they had heard only this week of their big neighbour, the Gas Light and Coke Company, losing one of their colliers—the *Fulgens*. He thought it was only right he should put on record the debt of gratitude the Company owed to their seamen. The staff of the Company had also done well. Their brilliant Assistant Engineer was not only doing a lot of work for the Company, but for the country. As the Chairman had remarked, Mr. Gill was a most able and zealous Assistant; and the Munitions Committee would find him equally so. Their indefatigable Secretary would speak for himself; but he (Mr. Jones) could not say anything too good of him. The whole staff of workmen also merited the thanks of the proprietors.

Mr. Bradfield, on behalf of the clerical staff, said he had much pleasure in acknowledging the vote of confidence, although in these trying and anxious times, one hesitated to take any credit for anything done except in the service of the country; for it was a matter of great regret to those of them who, through age, infirmities, or responsibilities, were unable to give such services. Mr. Stanley Jones had referred to him, and he should like to thank him, and at the same time tell the proprietors that he had never met a man with so much consideration for his assistants as Mr. Jones. He was a charming man with whom to work. He might mention that the various Societies for the employees were all very flourishing; and they were enjoying a period of excellent health throughout the works. The Chairman had referred to the five losses sustained at the front. It was an interesting, though melancholy, coincidence that, of these five men, one went from the Poplar works, one from the Wapping works, one from the Stepney works, one from the engineering staff, and one from the clerical staff. So that all stations and departments had given one life in the service of the country.

Charges for Public Lighting at Totnes.—In considering the question of the lighting of the streets in the ensuing year, the Lighting Committee of the Totnes Town Council invited tenders from the Gas Company on certain alternative bases, and recommended the acceptance of a charge or £2 10s. 6d. per lamp—the Company to start extinguishing the lights at 10.30 p.m., instead of the former time of 11 p.m. A condition of the offer was that, if an order is made by the naval or military authorities for reducing the lighting, a fair allowance is to be made by the Company. The Mayor (Mr. Windeatt) said the charge proposed was 2s. 6d. per lamp more than under the old contract, and there were 119 lamps. Seeing that for a considerable time there had been practically no lights at all, he thought they would do better by accepting a tender of £2 9s. per lamp, with none of the lamps lighted from May 15 to Aug. 15; the hour of extinguishing to be 10.30 p.m. If it became necessary to light the lamps between May and August, they could arrange with the Gas Company. It was decided to act upon the Mayor's suggestion.

BRENTFORD GAS COMPANY.

The Half-Yearly General Meeting of the Company was held last Friday, at the St. Ermins Hotel, Caxton Street, Westminster, S.W.—Mr. R. J. Neville Neville, M P., in the chair.

The Secretary (Mr. John T. Croxford) read the notice convening the meeting; and the Directors' report and the statement of accounts (some particulars from which were given in the "Journal" last week, p. 253) were taken as read.

The Chairman's Speech.

The Chairman, in moving the adoption of the report and accounts, said this was an extremely important meeting; and the report presented several features which were novel to most of the proprietors. Probably it also presented a more favourable character than anybody this time last year, or even six months ago, could possibly have foreseen. The report, however, was not quite comparable with any report the proprietors had had before, owing to the fact that since January of this year it incorporated the accounts of the two Companies which were amalgamated with the Brentford Company on Jan. 1 last—the Staines and Egham Gas Company and the Sunbury Gas Company. In the accounts, for the purpose of comparison, they had added the figures of the two Companies to the Brentford figures for the corresponding half year, so as to make the best comparison possible. The accounts were not, however, comparable for another reason—that the Staines and Egham Company were in the habit of making up their accounts to September. Therefore, in the present accounts, they had had to allow for this discrepancy.

ANNUAL ACCOUNTS AND MEETINGS.

Before discussing the accounts, he should like to say that the experience of their Company, and of a great many other gas companies, showed that it was very difficult indeed to form any accurate opinion as to the state of the accounts by the half-yearly system. Of course, the proprietors all knew that one portion of the year had a very much larger consumption of gas than another—for instance, the June half year was a lighter one than the winter half year; and the result of this was that the June half was always much better than the December half. One reason for this was that their Company depended to a very large extent upon the automatic meter consumers. In the old Brentford district, 90 per cent. of the houses using gas did so through prepayment meters. The automatic meter collections did not take place at any particular time, as was the case with the ordinary consumers. It went on *de die in diem*; and the money was collected from the meters on an average once every six weeks. The result of this was that after Dec. 31 there were three weeks' money collected, which amounted to an infinitely larger sum than the three weeks' collection made after June 30. Therefore the June half year was a better one than the December half. For this reason alone—and there were others—they did not get a fair view of the position of the Company by looking at it merely half year by half year. They nearly always had a good surplus at the end of the June half year; but they did not always make their dividend in the half year ending Dec. 31, although it was seldom indeed in the twenty years he had been a Director of the Company that, taking the two half years together, the Company had not a very reasonable surplus. He therefore thought it would be a good thing for the Company if there was only a yearly report and an interim dividend. The annual account would enable them to understand the situation of the Company much better than it was possible to comprehend it under the half-yearly account system.

A GOOD ACCOUNT UNDER WAR CONDITIONS.

Looking at the present accounts, he did not think there was any gas company in England which had accounts comparable with theirs. This was the only company in London that had not increased their price; and this was remarkable when they remembered what the price increases in some of the other companies had been. Then there had also been an increase in the sales of gas; and, in fact, there was hardly an item which was not more favourable than before the war began. This was a position of which any proprietor might be proud. But the half year was not a fair one, because the current half year was going to be a most difficult one, although the Directors thought and believed that, if things went on in the way they were going now, at the end of the year they would still show a surplus—not a big one perhaps. He should like the proprietors, if they had any views, to express them on the subject of holding a single meeting in February, when they had the whole year's accounts before them, and of sending out an interim dividend. Now that they were starting an enlarged career with the two Amalgamated Companies, the time seemed favourable for reconsidering the position in this regard.

FAVOURABLE COAL POSITION.

This had been an extremely difficult time for all engaged in trade or commerce of any sort, and also, of course, for gas companies owing to the price of coal having gone up so enormously. The actual additional price of coal and oil, due to the favourable situation in which the Company were at this time last year, and also on Jan. 1 of this year, amounted to 1s. 7d. per ton; and he thought there were very few companies who could show such a satisfactory position as this. The price now being paid was 17s. 10d. per ton, as against 16s. 3d. this time last year. When they remembered the deplorable strikes and other troubles in the coalfields, the increase in freights, and the advance in the price of coal last winter, the condition of affairs would, he thought, be considered excellent. The price of coal and freights and deliveries of coal became such a scandal last winter that there had been many conferences, and Parliament had at length to consider the matter, and eventually a Bill was hammered-out (which became law a week ago), under which there was to be a limitation of coal prices. It was hoped that the Company would get some of the benefit under the Act, because most of their contracts, which were included in the average price he had given (17s. 10d.), were made since April, and at a much higher price than the Act allowed. He could not say how much, but he did hope that the Company would obtain some relief on their price. The Act was not, in his opinion, going to do as much good as many people hoped; but it was going to do something.

COAL STORAGE—OLD AND NEW.

Another feature which was an extremely interesting one was that not only had the price of coal been extravagantly high, but there had been great difficulty in getting deliveries. Some companies had been almost on the rocks—not very far from where they were then assembled, there was such a shortage that the Company were afraid they might not be able to carry out their statutory obligations. In the case of the Brentford Company, they started the year—June, 1914—in an excellent position in regard to coal stock; and they had managed to hold their own. Not only had they held their own, but they were now in a bit better position than a year ago. But this meant a large sum of money locked up. It would be seen that they had now 59,802 tons of coal in store, and that the value of the coal and oil in stock was £73,971. This was equivalent to putting £73,971 on the ground until they wanted it. The Company had now to carry this large stock, whereas a few years ago they did not carry much more than 30,000 tons, and coal was then much cheaper. Therefore they did not have to put down so much money for coal stock then as at the present time. But it was important to the Company to have a proper stock. They must be independent of all exceptional circumstances—such as colliery troubles and high freights. The £73,971 meant 23 per cent. of the gross revenue for the half year, or nearly 9d. per 1000 cubic feet of gas sold; so that they had to carry out their business with their hands tied behind them to the extent of this £73,971.

CAPITAL ISSUE.

It was due to this large stock of coals that they had found it a little difficult for some years to carry on without increasing the capital. The fact was they were short of working capital. This brought him to the point that, in pursuance of the resolution passed at the previous meeting authorizing the issue of new capital, and having obtained the permission of the Treasury, the Directors sent out circulars inviting applications for the capital, and obtained a very handsome reply—a reply the extent of which, he confessed, he had had no hopes of receiving from the proprietors at such a time. The Treasury authorized them to raise another £150,000; and the proprietors found them £135,000, which he thought was a magnificent response. As he had pointed out, they had to carry large stocks of coal and oil, and they were even now a little short of working capital. But there was still £15,000 of the amount they were authorized to raise; and the Directors would be prepared to receive from any proprietor an offer to take a portion of this balance.

OIL CONTRACTS.

Returning to the subject of raw materials, he said the Company had been favourably situated with regard to oil. They had always taken pains to comply with their statutory obligations; and they had always aimed at having the best possible plant with which to deal with their raw materials. They had had very favourable oil contracts; and the fact that coal and oil had not together cost them more than 1s. 7d. per ton more than this time last year was largely due to the favourable oil contracts, which were still running, and would cover a considerable period in the future.

BUSINESS DURING THE WAR AND AFTER.

Now they had taken over the Staines and Egham and the Sunbury Companies; and they had a very gratifying increase from both of them. There had been a 5 per cent. increase in consumers in the case of Staines; and there was also an increase in their own district. So that they had not gone back in a single item during the half year. There was an increase in the sales of gas of 1·65 per cent. and no advance in the price; and two-thirds of the sales increase had taken place in the lightest quarter. They had also made their dividend, with a handsome surplus. The profit, in fact, as seen by the accounts, was some £8000 more than it was this time last year. The increase in the gas business had been largely due to the great number of factories in the district supplying Government munitions for the Army and Navy. They had also had a large number of soldiers billeted in their area, and gas had had to be used for cooking for them. The working class residents, too, had had more money to spend, owing to separation allowances, war bonuses, and other things; and so they had been able to spend money upon more cooking, and perhaps better cooking. Anyhow, the slot meters had done extremely well; and to this was largely due their prosperity. It was only right, however, to point out that, after these allowances and war bonuses ceased, and they came back to bed-rock conditions at the close of the war, the Company would, among others, be bound to feel the reaction. Therefore, they must be careful to husband their resources, and not to count upon the fact that in the future they would be in as favourable a position as they were in that day. As a point of interest, he might mention that their maximum hour's consumption occurred last month; it was usually the hour between twelve and one o'clock of the hottest Sunday in July.

NOTABLE ITEMS IN THE ACCOUNTS.

Regarding the accounts, coal had cost them about £10,000 more; but some good savings had been effected. Mr. Johnston, their excellent Engineer, had spent an enormous amount of time in promoting the efficiency of the plant. The make of gas per ton of coal had gone up something like 200 cubic feet per ton, which made a great deal of difference to them over the whole amount of coal carbonized. The unaccounted-for gas had become less. In fact, wherever there was anything to be gained by economy, their Engineer had done his best to secure it. The items of repairs and maintenance of works, and the repairs, maintenance, and renewal of mains, meters, stoves, &c., were perhaps more moderate than they had been for many years. As the proprietors knew, the Board had been most generous for many years in the way they had renewed and dealt with repairs and renewals; and the Company were now feeling the full benefit of this. Now they were running a little more easily. Heavy constructional work was also mostly done. Two other noticeable items were the active service allowance, £4306, and the war bonus, £2305, which together meant about £13,000 a year. In these two items, the Company were paying very nearly the equivalent of 1d. per 1000 cubic feet. They were new items; and, in spite of them, the balance carried to profit and loss account, as he had said, was £8000 better. They had had extra burdens to bear; but still they had a bigger profit. In the profit and loss account, there were extraordinary items which would not occur again. There was an item of compensation to the Directors and officers of the two Companies which they had taken over, amounting to £19,000. There was also the charge for conveyance and stamp duty, that they had been paid out of the undivided balance, which had been reduced by these amounts. The dividends only required £49,363; so that, as he had said, they would have something extra to carry forward to the current heavy half year.

THE COMPANY'S PART IN THE WAR.

A great many of their men had gone to the war—over 400 of them—and he regretted to say that twenty of them, perhaps more, had made the supreme sacrifice. There were about 100 who had been wounded. In passing, he might also allude to the fact that the son and partner (Mr. J. D. H. Radcliffe) of the Solicitor to the Company—a man of great promise, who last year helped to carry through their Act—was killed only a week ago. He was a man of exceptional brilliancy, both as a scholar and in his profession. So the Company had borne their full share of sacrifices and losses which the war was putting upon every family and every institution. The Company had also undertaken, and were ready to undertake, any work which the War Office authorities and the Munitions Committee thought they were capable of performing. They were recovering toluol for high explosive purposes; and they were going very shortly to enter upon the work of shell making. They had a large shop at Southall where they had installed for their own purposes lathes and machine tools; and they had now been appointed under the Munitions Committee a local depôt for munitions. In this shop they would soon be turning out 18-lb. shells. He was sure the proprietors would be pleased to learn that the Company were taking some part in this extremely important work.

Sir Robert Shafto Adair, Bart., seconded the motion.

Mr. George Ennis and Mr. Herbert Weller (late Chairman of the Staines and Egham Gas Company) spoke in favour of the annual meeting, and congratulated the Directors upon the excellent report. Later Mr. Ennis tested the feeling of the proprietors on the subject of the annual meeting by proposing a resolution (which Mr. Budgen seconded), to the effect that an annual meeting should be held instead of a half-yearly one. This was carried; and the Chairman said that the matter should be formally brought before the proprietors next February, as it was one which was entirely for their decision.

The motion for the adoption of the report and accounts was then unanimously carried.

Proposed by the Chairman, and seconded by Sir Robert Adair, the following dividends were declared, subject to income-tax: A dividend at the rate of 5 per cent. per annum on the preference stock, at the rate of £5 12s. per cent. per annum on the "A" consolidated stock, and at the rate of £5 10s. per cent. on the "B" consolidated stock.

Moved by Mr. Charles E. Nuthall, and seconded by Mr. William Morris, a hearty vote of thanks was passed to the Chairman and Directors and the officers of the Company.

The Chairman, in the course of his reply, spoke of the confidence that the Board had in Mr. Johnston, the Engineer and Manager, and of the good work performed by the Secretary (Mr. Croxford).

TOTTENHAM DISTRICT LIGHT, HEAT, AND POWER COMPANY.

The Annual Ordinary General Meeting of the Company was held last Saturday, at the Works, Willoughby Lane, Tottenham—Sir Corbet Woodall, D.Sc., in the chair.

The Secretary (Mr. E. Topley) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

Gas Consumption and Price during the War.

The Chairman, in moving the adoption of the report and accounts, said the latter showed that the Company were bearing the strain of the war extremely well. Notwithstanding the darkened streets and shops, and the lessened consumption of gas due to the household economy which was being widely preached and wisely practised, there was still an increase in the gas sold of 1½ per cent. over the corresponding period of last year; and this could not but be regarded as satisfactory. War had made nearly all the factories in their area busy; and the Company had had increased demands from many of those who already depended on them for power. In addition, they were gratified that two factories which had their own gas-works—viz., the Enfield Small Arms Factory and the Edison and Swan Electric Lamp Works—were now taking supplies from the Company. Beyond this, the Alexandra Palace, which was now being used as an internment camp, had largely increased its demand. It was perhaps not surprising that, while the middle-class consumers were economizing, as was evidenced by a decrease for the six months of 1093 cubic feet, or 4·74 per cent. per ordinary meter, the manual workers (who formed the great majority of coin-meter users, and who were prospering greatly) used 286 feet, or 3·31 per cent., per meter more. The Directors had striven long against advancing the price of gas; and the innate strength of the Company had made it possible, notwithstanding the decreased consumption and increased expenses, to pull through without such an advance, had it not been for the great rise in the price of coal, which rendered a continuance at the price of 2s. per 1000 cubic feet impossible. The proprietors who read the local Press would have noticed that a difference, now happily adjusted, arose between the Tottenham District Council and the Company over this matter. The Company desired to raise the price to 2s. 4d.

By an undertaking entered into in May, 1913, when the Company's Bill was before Parliament, the Council had it in their power to prevent the price being raised to more than 2s. 1d. until May, 1916; and at first they thought it their duty to exercise their veto. On further explanation being given to them, however, and especially in view of the fact that to continue the price at 2s. or 2s. 1d. would have meant a heavy loss to the Company, which must be made good by those who might be consumers after Midsummer, 1916, the Council reconsidered the whole matter; and a compromise was arrived at by which the proposed increase was reduced to 3d., making the price from the reading of the meters at Midsummer 2s. 3d.—still very low for London or the suburbs. The Directors trusted that this increase might be found sufficient; and they would endeavour to make it so. They regarded the incident as another evidence of the value of the cordial relations which had so long subsisted between the Council and the Company, who were both animated by a common desire for the welfare of the community they served.

WORKERS AT THE FRONT AND AT HOME.

The work of the Company was being carried out with some difficulty. About 260, or 30 per cent., of the employees had temporarily left for active service for their country; and the necessary replacement of the majority of them had not been easy. Mechanics of all kinds and skilled motor drivers were very scarce; and, generally speaking, in all classes the soundest men were with the country's forces. Abundance of employment in the neighbourhood, and with wages more than liberal, had formed temporary counter-attractions to co-partnership. By granting war bonuses, the Directors had helped the men to meet increased expenses; and they were generally satisfied. Extra men had been required as the Company were undertaking important work for the War Office in producing, in different ways, materials for the manufacture of high explosives. The prospect of carrying on through the increased pressure of the winter's work gave rise to some anxiety; and the Directors felt that, if the supply of gas was to be safeguarded, it would be impossible to allow further enlistments from their employees. Fortunately, up to the present, the casualties among the Company's employees at the front and in the Navy had been few—only three deaths (Thomas Sutton, whom he mentioned at the last meeting, Thomas C. Piggott, and W. A. Spencer) having become known to them, and sixteen cases of severe wounds. There were also four who were prisoners of war.

THE CAPITAL ACCOUNT.

Dealing with the accounts, the capital charge per million cubic feet of gas remained about the same as during the previous six months—viz., £438 per million. Unfortunately, the new section of the works, which it was hoped would be ready to help to meet the coming winter's demand, could not now be finished in time for this purpose; and the standstill of the capital per million was due to this cause, but there must in the near future be a material increase of the relation of capital to business. The delay was satisfactory in some respects, because the increase of output had been checked, and at the same time the difficulty and cost of issuing further capital just now would be unusually great. The new show-rooms at Enfield were complete and had been opened. It was gratifying to know that, from experience gained, there was no doubt that the public would greatly appreciate the convenience of these new offices and show-rooms, and that much business would be done in the latter.

COAL AND OIL SUPPLIES.

Turning to the revenue account, it would be seen that coals had cost less by £2500. This was owing to the quantity used being 3100 tons less than in the corresponding period. Coal supplies were so difficult to obtain that the Directors had had to adopt the policy of making more oil gas. They had had very anxious times so far as the coal supplies were concerned. During February and March, this was especially so. At one time the coal actually in stock on the works was so small that it would only have met five days of the reduced requirements. The causes of the short supply of coals were largely a shortage of railway waggons, congestion of traffic on the railway, and delay in transit, making the shortage of waggons still more pronounced. In addition to this, enlistments at the collieries were extremely heavy, and by far the largest proportion was from among those who actually hewed the coal. This restricted the output, and at the same time a trade boom increased the demand. The combined effect had, of course, been to increase the price enormously; and this effect would be felt far more during the current half year. This, he thought, would be apparent to all the proprietors, because in the half year with which they were dealing—the half year to June 30—a considerable portion of the coal bought at the lower price in the previous year came into use, and was now practically exhausted; and they were now carbonizing the high-priced coal almost exclusively. Restricting the output naturally tended to higher prices, and, under the miners' sliding-scale, higher prices for coal meant higher pay to the miner. This enabled him with less work to satisfy his wants; and thus the output was still further restricted. The Company had renewed contracts at prices varying from 4s. 6d. to 7s. per ton rise. As was generally the case when coals were dearer, the quality was inferior, and the make of gas per ton had fallen to 12,811 cubic feet, as against 13,148 feet in the corresponding half year. On account of the larger make of oil gas, the next two items—coke and oil—were up by £6400. Working results were not so good as in the previous half year, due to the Company having to help the poor coal as far as possible to maintain production of gas and illuminating power. In connection with oil, it might be mentioned that there was a serious prospect of shortage in the supply of this material for gas-making purposes, due to the Admiralty having commandeered so many tank-steamers, and, he might add, owing to the Germans having added to the difficulty by sinking a few of them. At the present time, there was little oil in the country, and a serious position was likely to arise, unless the Admiralty found it possible to release some of the steamers. This matter at the present time was receiving the careful consideration of the Board of Admiralty. Wages and gratuities at the works showed a considerable decrease. This was partly because of the increased quantity of oil gas made, which required a much smaller number of workers; but it was far more on account of the realization of one of the objects of amalgamation with Enfield—viz., the economy of manufacturing gas at the more modern works at Tottenham for supplying the Enfield district.

OTHER ITEMS OF EXPENDITURE.

Repairs of works showed an increase of £1200; but this item was by no means excessive. Salaries in the rental and inspection departments were less because of the employment of boy and girl clerks for carrying on while the regular men were fighting. Repairs of mains were temporarily down £2300, because, owing to the shortage of labour, it had been found necessary to send the main gangs to do service for the Company at the works. The two unusual items which closed the debit side of the revenue account – viz., payments to dependants of men on war service and the war bonus on wages to help in the matter of the increased cost of living—the Directors felt assured would meet with the hearty approval of the proprietors. It might be noticed that several items which usually did not vary were slightly down. But this was because, for the first time, electricity appeared in the accounts, and certain costs had to be divided between gas and electricity in proportion to the capital respectively employed.

GAS AND RESIDUALS.

Regarding the credit side of the account, the increased income from gas and decreased return for public lighting had already been explained. The unaccounted-for gas for the half year amounted to 6.45 per cent. The returns for residuals needed some explanation. Coke realized a slightly higher price per ton, but had given a less return because a less amount of coal had been carbonized. Difficulties had been experienced in the delivery of coke to their customers, who usually took their supplies by rail, as the stations to which most of their coke was consigned had been closed to all except Government traffic. Fortunately, they had made an increase to their fleet of motor lorries. These continued to be very serviceable and increasingly popular with their coke customers; and by their use they were gradually securing a monopoly of the coke trade within cartage distance of their works. Tar showed a very satisfactory return on paper. The price had dropped enormously, nearly 25 per cent.; but the production had been surprisingly great, and had made up for the bad price. He was not at all sure that, when the next account was presented, the large return this half year would not be qualified. Sulphate returns were regrettably poor, as regards production and price. There did not seem to be anything mysterious about this, except that there had been a little mistake in taking the stocks. The usual quantity of ammonia did not appear to have been in the coal which they had used; and they undoubtedly lost a considerable proportion owing to a serious breakdown in the scrubbing plant, repair parts for which they were unable to procure from the makers for some months, owing to their being urgently engaged on war work. As to price, a great slump took place last autumn; but a remarkable recovery had been made, partly due to the fact that the German supply to the world's markets had been stopped, and partly on account of the organization of the sulphate of ammonia trade by the formation of an Association for this purpose, and which had been very helpful. The Company's advance sales were made before the recovery took place; and they had not, therefore, obtained the full advantage that would be secured in the current half year. In connection with sulphate of ammonia, it might be mentioned that considerable difficulty had been experienced in obtaining the necessary acid for the manufacture, as so much of it was required by the Government for making munitions. On the whole, he thought the accounts would be considered satisfactory, having regard to the great difficulties with which they had had to contend during the last half year.

THE ELECTRICITY UNDERTAKING AT WOOD GREEN.

The electricity undertaking showed a small loss for the half year. This was inevitable. Although the number of consumers was steadily increasing, and was now over 90, progress had been delayed by the war. Very many who intended taking current had deferred it for the present. The early charges against revenue, such as stationery and similar items, were disproportionately great. The fixed charges, such as rates and taxes and wages, would allow of an increase many times as great as the output in the past half year without a corresponding increase in expenses; and it might be expected with some certainty that the small deficiency in the revenue account would soon be converted into a surplus. The gas used in generating included a considerable quantity employed in engine trials and testing, and also for drying the building. The engines were not quite satisfactory; and the consumption of gas per unit had been very considerably reduced. In all ways, they had reason to be satisfied with the start made.

THE BURDEN AND VICTORY.

Six months ago he closed his observations by saying that he looked forward with an easy mind as to what would be their position when next they met. That day he was content to stand where they did. They were paying their full dividends; and, although there must be a reduction in them in the immediate future, it might be hoped that it would not be for long. The burden of the war was a heavy one; and they would, without grudging the payment of their part, pray for a speedy victory worthy of the terrible cost.

Mr. Henry Bailey seconded the motion.

Mr. Dando inquired whether, so far as could be foreseen, the Board considered the electricity concern would be satisfactory.

Mr. Michel asked whether the electrical energy was used for power as well as for lighting. He had had a little experience of the economy of electricity for power purposes; and he thought that if it were more generally realized what a great advantage was to be derived by those who adopted electricity in a neighbourhood such as Wood Green, with an increasing population, the Company would not be long before they had a good many customers.

The Chairman said there was little to add to the observations he made in his address regarding the electricity undertaking. The Board were satisfied with it, although it showed, in the first half-year's working, a slight loss. The war breaking out when it did had hindered people spending money which they could avoid, and so it had prevented changes being made. Respecting the consumption of electrical energy for power, Wood Green was almost entirely residential; and while they had one or two power users to a small extent, generally speaking, the current was used for lighting.

The motion was unanimously carried.

The Dividends.

Mr. James Randall moved the declaration of dividends at the rates per annum of 5 per cent. on the preference stock, 7½ per cent. on the "A" consolidated stock, and 6 per cent. on the "B" consolidated stock, all less income-tax, and payable on Aug. 14.

Mr. Henry Woodall seconded the motion, which was unanimously adopted.

Directors and Auditor Re-elected.

The Chairman said he had a letter from Sir Daniel Goddard, M.P., saying how sorry he was he could not be present that day. He was one of a large number who were deputizing about the country, helping in the national service in more ways than one—especially in the matter of recruiting. Proceeding, the Chairman proposed the re-election as a Director of Mr. James Randall. It was, he remarked, utterly unnecessary to say anything in commendation of this proposal. Mr. Randall had been known more than anybody else on that side of the table in connection with the Company; and his record had always been one of good and faithful service—not only as an active officer of the Company, but, as he (the Chairman) well knew, as a colleague on the Board.

Mr. G. Osborn seconded the motion, which was heartily passed.

Proposed by the Chairman, and seconded by Mr. J. Walker Ford, Mr. Henry Bailey (who formally retired in order to regularize the re-elections under the Act of 1913) was also re-elected.

Both Mr. Randall and Mr. Bailey responded.

Moved by Mr. Malyers, and seconded by Mr. Dando, the retiring Auditor (Mr. John Eve) was re-appointed.

Mr. Eve, in acknowledging the continued confidence of the proprietors, praised the excellent system under which the books were kept, and which enabled the accounts, despite the enormous amount of detail, to be prepared for the proprietors promptly after the close of the half year.

Votes of Thanks.

Mr. Michel proposed a hearty vote of thanks to the Chairman and Directors, and to the officers, staff, and workmen for their services. He remarked that the proprietors were very grateful to the Board and the officers, for some of them hardly anticipated quite such a favourable report as they had received. Many of them had been predisposed, from their experience in connection with other companies, to fear their dividends this half year might not be so good as those that had immediately passed. They were sure the Chairman and Board must have had a most anxious year. It had been an anxious one for them all. But in the conduct of the affairs of the Company, with a large part of the staff directly serving the country, the Board must have been in a difficult position. There had also been considerable difficulties to contend with in connection with coal and oil. In expressing their grateful thanks, the proprietors desired to do so with peculiar emphasis, as they thought not only of the Chairman and his colleagues, the Engineer, the Secretary, staff, and Auditors, but of the 200 of their employees who were away, and remembered the anxiety of their relatives. They wished their expression of sympathy to reach the relatives, and their condolences with those who had lost those who were dear to them. That day therefore their vote had an added significance. They hoped that their men who were now serving the country in different ways, either on the Continent or at home, would be spared to come back to them, and long remain an integral part of their staff.

Mr. H. C. Weld seconded the motion, which was carried.

The Chairman, returning thanks on behalf of himself and of his colleagues, said that their feeling was one of complete sympathy with the expressions Mr. Michel had used as to the times through which they were passing, and as to the men who had gone from them and those who were at home working for them. It had been a time of great anxiety; and he hoped that the local authorities and the consumers were satisfied that they were not simply men who were striving to get the uttermost farthing out of the undertaking, but that they did feel they had obligations, as well as privileges, in their position as a public company, and that they strived to live-up to these obligations to the utmost possible extent. It was true the Urban Council for a time declined to entertain the idea of an immediate rise in the price of gas; but the Board were more than gratified by the fact that, after the Council had passed a resolution to that effect, they reconsidered the matter and agreed to the increase which was now being made. The effect of this would be, he hoped, that no further increase would be necessary; but if there had not been this increase now, there would have been one in future of a larger amount. With regard to the workmen, he desired to say that, so far as he could see and know, there was keen anxiety on their part to be of use in the position they occupied. The Company were doing all they could to help the War Office in the heavy task they had in front of them; and he believed that every man who was capable of doing service on the works would do it. They were anxious to do all they could to help the country, although they might not go out to fight for her.

Mr. A. E. Broadberry said that Mr. Topley had asked him to reply on behalf of himself and his staff as well as for the engineering staff and workmen. He therefore, on behalf of all, thanked the proprietors for their vote of thanks, which was very encouraging. The workmen almost to a man were working earnestly and cheerfully for the Company. Temptations had been held out to them by the high prices of labour in the different factories round about. But the majority of them knew the Directors had their welfare closely at heart, and that so long as they gave good service to the Company they had permanent work. The war was not going to last so long as the men would require service; and this the men appreciated. With the strong and firm example that the Chairman gave them, officers and men alike would be very poor tools indeed if they did not do their best.

Mr. J. L. Chapman, on behalf of his co-auditor and himself, also thanked the proprietors. The Company, he said, had a valuable staff. In view of the many difficulties the Company had had, it was a pleasure to see the wonderful manner in which they had come through. He looked to the small increase of the price of gas in the current half year fully adjusting matters.

NEWPORT (MON.) GAS COMPANY.

The chair was taken at the half-yearly meeting of the Company by the Deputy-Chairman (Mr. T. G. Cartwright, J.P.), in the absence through ill-health of Dr. H. M. Brewer. It was pointed out that over sixty employees had joined the Colours; the difficulty with the men having been not to get them to go, but to persuade them to remain behind. The appointment of the Manager (Mr. J. H. Canning) as head of the department in South Wales in connection with munitions of war, was felt to be a great honour for him and for the Company. The cost of everything had gone up; and they were paying out an amount of £664 each half year to the dependants of the absent employees. All this had necessitated an increase in the price of gas. There had been some falling off in the sales of gas; but the whole of the accumulated stock of coke had been disposed of at fairly good prices. The new coal contracts showed an increase in price of no less than 10s. 6d. per ton. The report having been adopted, the statutory dividend of 5 per cent. per annum was declared. A vote of thanks to the staff was acknowledged by the Secretary (Mr. T. H. Hazell), the Engineer (Alderman T. Canning), and Mr. J. H. Canning. Alderman Canning, referring to the fact that there had been a diminished demand for tar, said the falling off partly arose from the view taken by corporations and county councils that this was a time to economize. So it was; but if to economize meant to bring about loss, there could be no economy. The putting of tar on the roads had meant, so far as Newport was concerned, the saving of two-thirds of the cost of repairs to the roads and three-quarters of the cost of sweeping.

WAR BONUS STRIKE AT MACCLESFIELD.

A Speedy Settlement.

Last Tuesday and Wednesday week, 115 employees of the Gas, Water, Highway, and Health Committees of the Macclesfield Corporation left work, in accordance with notices tendered a fortnight previously by the National Union of Gas Workers. The number of employees of the Gas Committee who ceased work was 36, and of the Water Committee 15.

During February, an application for an advance in wages of 5s. per week was made by the men; but the Town Council declined to grant any advance. Subsequently, Mr. J. R. Clynes, M.P., the Lancashire District Secretary of the Union, wrote urging the reconsideration of the question, and hinting that something less than the 5s. originally asked for would be accepted. A Special Committee, consisting of the Chairmen of Committees, considered the whole question, without, however, conferring with the representatives of the men; and they made a recommendation that the Committees be empowered to grant a war bonus of 2s. per week to employees, with dependants, in receipt of less than 25s. per week. The Council adopted this recommendation; and forms asking for particulars with regard to income and dependants were issued to men earning less than 25s. This concession did not satisfy the men, who also objected to the "inquisitorial forms" which had to be filled up before the bonus of 2s. could be allowed. In communications to the Town Clerk (Mr. F. R. Oldfield), Mr. Clynes contended that the amount offered was inadequate to meet the increased cost of living, and that the method of making the grant discriminated unfairly between the employees. It was also urged that the Council should hear the men's side of the case, and that the dispute should be referred to arbitration. Matters, however, reached a deadlock; the Mayor stating that the subject could not be re-opened in the absence of fresh circumstances.

Following the cessation of work, interviews—from the beginning, the Council adopted the policy of no conferences or interviews—with the men's representatives took place; and it was again decided by the Special Committee that they could not recommend the Council to alter their decision as to the war bonus, or to depart from the previous attitude against a conference or reference of the dispute to arbitration. The same evening, a public meeting of the men on strike, and the local Trades Council, was held, at which a resolution was unanimously carried regretting the inconvenience caused to the townspeople, and placing the responsibility for the strike on the shoulders of the Corporation. It was also reported that the Trades Council had communicated with the Board of Trade, and asked for their intervention. In the communication, attention was drawn to the proceedings of the Corporation in dealing with the men's application. It was also pointed out that the Union did not desire a strike. What they complained of was the "stiff-necked and unpatriotic manner" in which the question had been dealt with by the Corporation. The men also complained of petty tyranny on the part of officials.

Mr. Clynes, addressing a meeting of the men, emphasized the point that the movement was entirely a men's movement, and was not in any degree owing to outside instigation. The stoppage of work was due, not to any extravagant demand on the part of the Union, but to the unwillingness of the Corporation to discuss, interview, or negotiate in any way. The Union had a right to insist upon discussion, upon interviews, and, if necessary, upon the submission of the question in dispute to arbitration. It had been left to the Corporation of Macclesfield to decline to meet the leaders of the largest Trade Union of its kind in the world. Failing discussion, they had no option but to hand in notices. As to the decision of the Council to empower the Committees to grant war bonuses of 2s. weekly to men whose wages were less than 25s., under certain conditions, Mr. Clynes said that one man in four or five had been picked out for this favour. The Union objected to discrimination between man and man. If they were going to pay a man according to his domestic circumstances, where were they going to land themselves? The principle was impossible. Men who were engaged on the same class of work should be paid the same rate of wage. They should pay for work according to its value; and if they were not getting value for their money, they should resort to the usual plan of getting men who did earn their money.

On the Saturday, it was announced that further negotiations which had been proceeding between representatives of the Corporation and their employees had been brought to a satisfactory conclusion; the men at a mass meeting agreeing to accept an offer made on behalf of the Corporation of a war bonus of 2s. per head to all workmen receiving 30s. per week or under, and 1s. to those whose wages exceed 30s. This bonus, it was also agreed, should be continued for three months after the termination of the war.

Immediately the strike occurred, official advertisements were issued to gas consumers giving notice that the Gas Department could not guarantee a supply of gas during the continuance of the strike, though every effort would be made to maintain it. Mr. J. E. Blundell (the Gas Manager) had, however, no difficulty in keeping up an uninterrupted service during the brief period the men were not at work—indeed, he had made complete arrangements to "carry on," had it been necessary to put them into operation. The water supply was entirely unaffected by the strike.

BELFAST GAS SUPPLY.

The Engineer and Manager of the Belfast Corporation Gas-Works (Mr. James D. Smith) forwards a copy of the report of his Committee, together with the accounts for the year ended March 31.

According to these, the gross profit on the manufacture and sale of gas and residuals was £45,098—being a decrease of £18,187, as compared with the previous year. Bankers' interest and rents received from property purchased for the projected extension of the gas-works realized £456; and there was a profit on the working of the stoves department of £962. From the total gross income of £46,516, there was deducted for dividends and interest on capital £15,953, and the equivalent of interest on the redeemed stock £4833. The net profit thus shown (£25,731) was a decrease of £19,896 compared with the previous year. There was brought into the account from the 1913-14 accounts an amount of £23,413, and the total credit of the profit and loss account was £49,144. It has been determined to carry £7976 to the sinking fund, £1600 to the reserve fund for insurance of works, and £3000 to the contingent renewal fund. These three sums, together with the cost of the thirtieth issue of stock (£3160), will leave a balance for disposal of £33,408.

The Committee have already contributed for public purposes £10,000 in aid of the rates, and £11,311 as dividends and sinking fund on the new City Hall stock. The result was that an amount of £12,097 will be carried forward to the credit of the profit and loss account for the current year.

The following is a summary of the allocation of profits from the gas undertaking during the past forty years—since the works were taken over by the Corporation in 1874.

	£	s.	d.	£	s.	d.	£	s.	d.
Total gross profits, 1874-1915				2,013,170	16	3			
Less interest and dividends				628,231	11	0			
Net profits							1,384,939	5	3
Allocated as follows:—									
Sinking fund	236,634	11	11						
Extension of works, &c.	484,377	15	11						
Depreciation	111,231	13	1						
Reserve funds	130,523	1	3						
Extension of retort house stock	2,874	0	0						
Cost of issuing stock	12,800	18	5						
Cost of arbitration, Belfast Corporation Act, 1912	1,394	12	8						
				979,836	13	3			
Payments to City Council, as follows:—									
General purposes fund, in aid of rates	187,500	0	0						
Dividends and sinking fund, new City Hall	146,074	17	3						
Parks Committee	3,913	9	11						
Library Committee	9,550	0	0						
Baths Committee	600	0	0						
Electric Committee	40,573	8	5						
Dials for Memorial Clock	300	0	0						
Temporary Albert Bridge	3,500	0	0						
Cost of Finance Bill, 1889	993	15	0						
				393,005	10	7			
							1,372,842	3	10
Balance at net revenue, March 31, 1915							12,097	1	5

At the Monthly Meeting of the Corporation last week, the minutes of the Gas Committee were submitted.

Alderman Craig, in moving their adoption, alluded to a recommendation to raise the price of gas to ordinary consumers 5d. per 1000 cubic feet gross, bringing it to 2s. 6d.—the new price to be subject to 20 per cent. discount. The gross profit of the undertaking for the year, he pointed out, amounted to £45,098, a decrease of £18,186 as compared with the previous twelve months. In June of last year, the price of gas was reduced from 2s. 3d. to 2s. 1d. per 1000 cubic feet, less 20 per cent. discount; and this was largely accountable for the reduced profits. It had always been the policy of the Committee to supply gas at the lowest possible rate; and they regretted that it was now necessary to increase the price. Coal, however, was costing 8s. per ton (or £16,000) more than last year; £5500 would be absorbed in paying the war bonus to employees and half-wages to reservists and volunteers; while sundry materials and expenses would cost £8000 more. From the total increase of £29,500, he deducted £9000 the estimated saving in cost of oil owing to a cheaper purchase. In 1904, the price of gas was 2s. 3d., whereas to-day it was 1s. 8d. net; and the proposed new price would be 2s. net. The contract price for coal in July, 1904, was 13s. 2d. per ton; whereas the contracts just made were as high as 25s. per ton. Gas had thus been reduced during the last eleven years 7d. per 1000 cubic feet, and even with the proposed increase would still be 3d. cheaper. The amount allowed off gas accounts as discount in 1904 was £11,200; and for the year ended in March last it was £36,000, or over 200 per cent increase. It was therefore evident that the interests of the consumer had not been neglected. They were proposing to increase the price to ordinary consumers from 2s. 1d. to 2s. 6d. gross, which was equal to 4d. per 1000 cubic feet net; and in the case of prepayment meters they would give 35 feet for 1d., instead of 40 feet.

The minutes were adopted.

A staff contributor to the Belfast "Northern Whig," dealing with the statistics for the past year, remarks that the proportion of water gas supplied to the public was 41 5 per cent., and coal gas 58 5 per cent. The cost of coal gas as delivered to the gasholder was 10d. per 1000 cubic feet, and that of the water gas over 13d. "The necessity to make a large proportion of water gas from considerations of space for many years to come," he says, "is another of the heavy bills that we have to pay for the dubious privilege of keeping the gas-works in the centre of the city."

SOUTH SUBURBAN GAS COMPANY.

Directors' Half-Yearly Report.

On Friday the shareholders' meeting of the South Suburban Gas Company will be held; and, in anticipation of it, the Directors have issued the following report. It is signed by the Chairman of the Board, Mr. Charles Hunt, M.Inst.C.E.

The delivery of coal has greatly improved since the beginning of the year; but the exorbitant prices required for the current year's supply necessitated a further increase in the price of gas of 5d. per 1000 cubic feet, as from the Lady-day quarter. This increase involves a further reduction of dividend, and also of the bonus paid to co-partners.

The net revenue account shows that, including the balance of £189 brought forward from last half year, and after providing for debenture and other interest and placing £2712 to the special purposes fund, the amount available for dividend is £32,862, out of which the Directors recommend the payment of statutory dividends (less income-tax) as follows:—

On the 5 per cent. preference stock	5 per cent. per annum.
,, ,, ordinary ,, ...	£4 16s. 8d. ,,
,, ,, ,, (West Kent) stock	£4 16s. 8d. ,,

Leaving to be carried forward to next half year the sum of £5074.

As compared with the corresponding half of last year, the consumption of gas shows an increase of only 0·06 per cent., the smallness of which is attributable to the exercise of economy on the part of consumers and the continued curtailment of public and shop lighting—851 new consumers having been added during the half year.

The receipts for residuals have been favourably affected by a great improvement in the demand for coke, and, to a less degree, in that for sulphate of ammonia.

There are now serving with His Majesty's forces 210 of the Company's employees, and others are assisting in the production of war munitions. At the suggestion of the Management Committee and members of the Livesey Memorial Hall and Institute, the use of this building as a hospital for the wounded has been offered to the Royal Army Medical Service. A vacant piece of ground belonging to the Company at Lower Sydenham was offered to the London County Council for the storage of coal for use during the coming winter.

Co-partnership—in spite of a reduction of its material advantages, which it is hoped may prove to be only temporary—is, if possible, more popular than ever, and the Directors attribute to it, in no small degree, the continued goodwill and hearty co-operation of all ranks of the Company's employees, which, at all times essential to the well-being of the undertaking, can never be more so than during this period of exceptional stress.

SALFORD CORPORATION GAS COMMITTEE'S REPORT.

The Engineer and Manager of the Salford Gas Department (Mr. W. W. Woodward) sends the following report of the Gas Committee to the Council of the County Borough. It is signed by Alderman F. S. Phillips, the Chairman.

In presenting to the Council the annual report for the year ended the 31st of March, 1915, your Committee have pleasure in recording that, notwithstanding the war, the number of consumers has continued to increase during the past year. The sales of gas have also shown an increase equal to 4·85 per cent.; but this increase is somewhat inflated by the fact that the meters were read at a later period than usual at the end of the year.

The coal and cannel carbonized during the past year amounted to 163,426 tons, as compared with 157,867 tons for the previous year; and the quantity of gas made to 1,807,138,000 cubic feet, as compared with 1,774,207,000 cubic feet for the previous year. The average illuminating power during the past year was equal to 16·42 standard candles—the parliamentary standard being 14 candles.

The works and plant have been maintained in a thoroughly efficient condition; and the erection of the installation of vertical retorts at the Regent Road works is progressing. This work, however, is only proceeding slowly, owing to difficulties connected with the war.

The demand for gas appliances generally has been very satisfactory; and the business done has been greater than in any previous year.

The total number of ordinary cookers on hire at March 31, 1914, was 10,509, and by the 31st of March, 1915, this figure had increased to 13,655. There were no prepayment cooking-stoves in use at March 31, 1914; but 2997 were fixed during the year ended the 31st of March, 1915. The total number of gas-fires on hire at March 31, 1914, was 469; and by the 31st of March, 1915, the number had increased to 1970. Unfortunately, these satisfactory increases are not likely to be maintained, as the Local Government Board have, for the present, prohibited the borrowing of any further money for such purposes; and consequently additional purchases are restricted to the amount of the unexpended money already borrowed.

Your Committee regret that the total receipts from the sales of residuals show a very large decrease compared with last year. The market prices of coke, tar, and sulphate of ammonia have fallen considerably; but the prospects for the current year with regard to coke and sulphate of ammonia are somewhat brighter.

Owing to the great fall—amounting to £8468—in the market value of residual products as compared with the previous year, and to the increased expenses due to the war, your Committee were reluctantly compelled to recommend the Council to increase the price of gas, as from Dec. 31, 1914, by 3d. per 1000 cubic feet to ordinary consumers, and to reduce the quantity supplied to consumers by prepayment meter from 35 to 32·73 cubic feet per penny.

Since this increase in the price of gas came into operation, your Committee have been faced with greatly increased costs owing to advances in wages, additional payments to dependants of men on active service, and to an enormous rise in the price of coal required for the current year. Consequently, your Committee were again obliged to recommend the Council to make a further increase in the price of gas, as from April 7, by 6d. per 1000 cubic feet to ordinary consumers, and to reduce the quantity supplied to consumers by prepayment meter from 32·73 to 27·27 cubic feet per penny.

Appended to the report is one upon the illuminating power of the gas, as tested by Mr. Francis Jones, M.Sc., F.C.S., F.R.S.E., in the course of which he says that the illuminating power of the gas made at both works was lower than the previous year's average. At the Bloom Street works the average illuminating power, as tested by the bar photometer, was equal to 16·36 standard candles. At the Regent Road works it was 16·47 standard candles. The highest test recorded was 17·66 standard candles; the lowest, 15·26 standard candles. The gas was tested for sulphuretted hydrogen by the ordinary lead paper test, and on no occasion was it found present. Subjoined are the results of the illuminating power tests for the last three years.

	Average Illuminating Power. Standard Candles.		
	1912-13.	1913-14.	1914-15.
Bloom Street works	18·59	17·47	16·36
Regent Road works.	19·22	17·96	16·47

BLACKBURN CORPORATION GAS-WORKS.

Mr. A. Morton Fyffe, the recently appointed Engineer and General Manager of the Blackburn Corporation Gas-Works, recently submitted a report [*ante*, pp. 253-4] to the Gas Committee, in which he gave facts regarding the present position of the undertaking, and recommended the taking of certain steps to improve the condition of matters. This report was discussed at the last meeting of the Council.

Sir Edwin Hamer (an ex-Chairman of the Gas Committee) moved that it be referred back to the Committee. He described the report as one of the most serious ever issued during his long connection with the Corporation. It told them that practically one of the largest and most important Committees was in a state of bankruptcy. If it were a private concern, bailiffs would be in, and the Official Receiver as well. In the case of the Gas Committee, however, they had the rates of the borough behind them. The Committee had visited the gas-works; and he supposed they were satisfied the report was correct. How did this bear upon what had happened during the last eighteen months? Eighteen months ago there was a serious strike at the gas-works, which cost the borough as much money as would have rebuilt the works in the most modern style. He asked, seriously, whether the Council had not better instal new plant, rather than spend money on apparatus which it was said would have to be taken out. The gas consumers had helped to make the works pay in the past; and now they would be called upon to pay rates to help the Gas Committee.

Mr. Gregson, who seconded, said they could not have a worse report respecting any other department. It would be a "scandal" to pass the matter over with a formal acceptance of the report.

Mr. Wild said he represented a district where the people largely used gas. The poor had been hard hit by the increased cost of living and the stopping of local weaving-sheds. The Corporation were now going to stop their light; for this was what the 7d. per 1000 cubic feet increase in price would mean in some cases. He had been asked why the price could not have been increased gradually for a few years, instead of putting on 7d. all at once. He suggested that the matter be referred back, and a reduction made respecting the proposed increase.

Alderman Crossley pointed out that the increase suggested had nothing to do with the management of the works, but arose out of outside conditions. The causes necessitating a revision of prices applied, not only to Blackburn, but throughout the length and breadth of the land. He agreed that this was probably the most serious report ever presented to the Council. He also agreed, however, that the policy adopted by the new Chairman of the Gas Committee (Alderman Nuttall) to face things, rather than to hide them and continue in a disastrous way, was much the wiser and better course. It was unfortunate Sir Edwin Hamer should have said, entirely unsupported by the report or accounts, that the concern was in a state of bankruptcy. It was nothing of the kind.

The minutes of the Gas Committee, including the acceptance of the report as published, were subsequently approved; Sir Edwin withdrawing his amendment.

STOCKPORT GAS-WORKS RESULTS.

The report of the Gas Engineer (Mr. S. Meunier) for the past financial year was presented at the monthly meeting of the Stockport Town Council last Wednesday.

Mr. J. Winter, in moving the adoption of the report, said that, when twelve months ago he had the same task to perform, he could not claim any success for the department over the previous year; and he now found himself in a similar position. The profits of the department last year were £8544, as against £13,911 in the previous year, a reduction of £5367. He attributed the reduction of the gas profits to the great fall in the price of residuals. As a matter of fact, previous to the war the price obtained for coke was very low indeed. For tar it was exceptionally low; and it was also low for liquor. After the war began, these prices went lower; but since March they had gone a little higher. The price received for coke in March, 1914, was 10s. 5d. per ton, as against 8s. 5d. in March, 1915; tar was 38s. 1d., as against 32s. 2d.; liquor, 13s. 3d., as against 10s. 7d. In May, 1914, coke realized 8s. 8d., as against 12s. 10d. in May, 1915; tar, 34s. 4d., as against 31s. 10d.; liquor, 11s. 9d., as against 13s. 6d. The shortage of revenue was caused also by the diminution of the consumption of gas for industrial purposes. From August until December most of the mills were partly stopped; and the town was in a depressed state. Naturally, the gas undertaking suffered very much indeed. Further difficulties were put in their way by the restriction of borrowing powers. If they could have had the borrowing powers to which they were entitled for this year's working, they could have installed plenty of stoves and grates which would have helped to increase the revenue. They had converted a portion of their plant to obtain an increased output of toluol; but if the Government were going to restrict the output of gas, they could not do what they desired in this direction. The unaccounted for gas was considerably less than any previous year; being under 5 per cent., which was very low indeed.

Alderman Graham argued that if the gas undertaking were worked on proper lines, the amount of revenue received from year to year, instead of being applied to the reduction of the rates, should be applied to purchasing any new plant that was required. It was an injustice to the consumers of gas that they should be saddled with such a continual increase of borrowed money; and this he thought accounted to a large extent for the poor results obtained during the past year. He was glad to see that the Government had refused to allow the Committee to borrow money for new plant.

Mr. Henry Bell (the Chairman of the Finance Committee) said if an undertaking in the course of an extension of its business spent £20,000 capital, and the £20,000 came out of the revenue, what became of the shareholders? The policy adopted generally in commercial undertakings where extensions were wanted for capital purposes was to increase the capital by borrowing. If the Gas Committee had applied the whole of the profits towards the reduction of the capital account, the town would be saddled in the coming year with very high rates indeed; and nothing tended to drive commercial enterprise out of a town so much as high rates. The money handed over by the Gas Committee to the Finance Committee last year in aid of the rates was just short of £8000, a reduction of £4000 on the previous year. No one wanted to pay a big price for gas; and the Gas Committee did not want the price fixed at a figure that made its use prohibitive to the manufacturers of the town. But the ratepayers had nearly a quarter of a million invested in the undertaking, and were entitled to some return on the capital; and the 3½ per cent. that was being returned was a very moderate sum indeed.

Alderman Hopkins said he did not think that a large number of ratepayers who were not gas consumers should have their rates reduced by 1s. in the pound at the expense of the consumers.

Alderman Green pointed out that the question of the sinking fund seemed to have been entirely overlooked. In that respect the Corporation differed from any private company. Money borrowed had to be repaid by a certain number of annual instalments; and while last year they still had to repay borrowed money, the Government would not allow them to take up any fresh money to put in new plant. The increase in the price of gas only corresponded with the increase in the price of coal. He did not believe in giving every penny in relief of rates; but the town's credit constituted the capital of the concern. The town borrowed the money, and was responsible for repayment.

The Mayor said the Borough Treasurer had called his attention to the fact that all the profits had not been applied in the reduction of rates. In 1911 as much as £6842 was placed to the reserve. This amount had gradually been absorbed; but still it had not been the policy of the Committee to pay every penny in relief of rates.

Mr. Winter remarked that the same method applied in Manchester as in Stockport. Manchester got £50,000 in relief of rates; and it would be a sorry day for Manchester if ever they stopped this.

The report was adopted.

Gas-Meter Testing.—The annual report of the Public Health Committee of the Middlesex County Council contains a few remarks as to the gas-meter testing-station at Edmonton, which was opened in July, 1900, as the result of an agreement entered into between the Middlesex County Council and Messrs. Thomas Glover and Co. Messrs. Glover and Co. were desirous of having gas-meters manufactured by them tested and stamped in close proximity to their factory at Edmonton; and, on their undertaking to make good any loss which might fall upon the County Council, the Sale of Gas Acts were adopted, and a testing-station opened. The income in excess of expenditure in respect of the testing-station during the past twelve months amounted to £815; and the total amount which has gone in aid of the county rate since the station was first opened is £13,944. A statement giving details of the meters stamped during the year to March 31 last shows that altogether there were 80,731 meters received from makers, gas companies, and consumers. Of this number, 75,072 were stamped and 5659 were rejected. The size of the meters varied from 1 to 1000 lights.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The accounts of the Edinburgh and Leith gas undertaking for the year ended May 15, which have now been passed by the Commissioners, were fully dealt with in the report upon them of the Treasurer (Mr. A. Canning Williams), given in the "Journal" a fortnight ago, p. 205. In submitting them, Bailie Lyon (President of the Finance and Law Committee) said the accounts showed that the gross profit amounted to £85,350, which was £10,242 less than the amount estimated in September last; the difference being due to a decrease in income of £8254, and an increase in expenditure of £1988. The charges for annuities and mortgage interest, and the contributions to the sinking and reserve funds (reduced, in the case of the special reserve fund, from 2d. to ⅞d. per 1000 cubic feet of gas sold) amounted to £101,874, or £16,524 in excess of the profit. Deducting from this sum the balance of surplus revenue brought from the previous year, the net deficiency stood at £10,023, which the Commissioners had decided to make good out of the general reserve fund. The profit had not come up to expectations, owing to a small reduction in the sale of gas (1·53 per cent.), a considerable falling-off in the returns from coke and tar, and special expenditure due to the war. The quantity of gas sold during the year was 1,988,328,500 cubic feet, the largest amount in any year except 1913-14, when it was 30,913 200 cubic feet higher. If it had not been for the greatly restricted public lighting, due to military precautions, which had effected a reduction of consumption by the public lamps of 31,971,800 cubic feet (38 per cent.), there would have been a slight increase in the sale. The amount paid in war service allowances during the nine months to Whitsunday was £4010.

The working statement shows that the quantity of coal carbonized and oil equivalent was 192,273 tons, with a make of gas of 2,115,981,000 cubic feet, or 11,005 cubic feet per ton. The percentage of gas unaccounted for was 5·34. The total number of consumers was 100,454, and the average price of gas per 1000 cubic feet 2s. 7·28d. net. There is a total length of mains of 444½ miles; and the public lamps number 12,305. At May 15, there were 17,735 gas-cookers on free loan, and 7309 gas fires and radiators on simple hire. The average cost of coal and oil equivalent per ton for the year was 12s. 6·76d., and per 1000 cubic feet of gas made 1s. 1·76d.

Owing to the large number of male lamplighters who have volunteered for army service, women are now employed by the Lighting Committee of the Glasgow Corporation; and a group of them have been photographed by the local "Daily Record and Mail." A thoroughly businesslike looking group they make, too, with their ladders, lanterns, and official caps. Only a month has elapsed since women started to do this work; and already there are 110 of them employed as lamplighters in the city and suburbs. They earn a minimum wage of 17s. for a working week of some 25 hours. They do not attend to the street lamplighting, but confine their attention to the stair lamps. The report is that they are giving every satisfaction to the superintendents—being punctual and efficient in the discharge of their duties.

Approval has been given of the new rates for gas in Glasgow. The domestic charge is 2s. 6d. per 1000 cubic feet for quantities up to 500,000 cubic feet, with reductions to 2s. 3d. per 1000 for excess quantities; and less rates for power and manufacturing purposes, and for hotels, clubs, and institutions. It was stated by a member of the Gas Committee that they were supplying gas in some instances at less than cost price. Fully 60 per cent. of the consumers are paying at the higher rate, while 40 per cent. are having gas at lower rates.

The annual report on the working of the Airdrie Corporation Gas-Works for 1914-15 was submitted to a meeting of the Town Council last Thursday by Mr. J. W. M'Lusky, the new Manager. The report stated that the quantity of gas manufactured during the year was 118,376,000 cubic feet—a decrease of 640,000 cubic feet, or 0·57 per cent. The quantity of gas made per ton of coal carbonized was 11,465 cubic feet. Considering the difficulties experienced in getting regular deliveries of coal, along with the fact that frequently complaint had to be made of the bad quality supplied, it was gratifying to find that such high carbonizing results had been obtained, almost equalling the record result (11,500 cubic feet) of the previous year. The total quantity of gas sold was 103,755,620 feet, a decrease of 2,279,580 feet, or 2·16 per cent. Unaccounted-for gas was 8,508,000 cubic feet, or 7 18 per cent.; a slight increase being due no doubt to the fact that during the year over 1200 yards of 6-inch high-pressure main were laid, on which frequent tests had to be made. The revenue amounted to £19,507, as compared with £20,771. Of this decrease, £716 was due to the reduction in gas sales, and £155 to the fact that the price of gas from the May to August quarter of 1914 was 2d. less than the price charged for the corresponding quarter of the previous year. Coke had brought in £459 less. The total expenditure under revenue account amounted to £14,892, a decrease of £1379. There was a decrease, or saving, in the manufacturing charges of £289. There was a surplus balance of £4615 to be carried to the credit of net revenue account to meet the annual standing charges; a sum of £26 carried forward from the previous year, and £16 of interest on money in bank—making the total at the credit of this account £4659. The total expenditure under the net revenue account was £6178, an increase of £402. This left a debit balance of £1519 to be carried forward to next year. Bailie Goldie (the Convener) moved the adoption of the report, and also the recommendation of the Gas-Works Committee that the charge for gas be increased by 5d. per 1000 cubic feet, making the price 3s. 4d. This was unanimously agreed to.

The Peterhead Town Council had before them at their monthly meeting last Tuesday a minute of the Gas Committee in which it was stated that the members had unanimously resolved to fix the price of gas at 4s. 2d. per 1000 cubic feet for consumers by ordinary meter, and at 4s. 4d. for consumers by prepayment meter—an increase of 6d. per 1000 cubic feet. Mr. Dingwall, in moving the adoption of the minute, said every gas consumer would be disappointed; but no thinking person would be surprised to learn that the past year, or, at any rate, since last August, had been the worst for many years for gas departments all over the country, and particularly for a seaport town like their own. The quantity of coal in hand or to be delivered at May was 3000 tons at last year's prices, which meant that they had only one half-year's supply to contract for at the advanced price—a saving of £1173. He felt it his duty to state publicly that consumers had to give Mr. W. Ritchie (the Gas Manager) most of the credit for this saving, as it was entirely on his advice that the Committee last year purchased about 2000 tons more coal than usual; and they scored handsomely.

The Loanhead Gas Company are paying a dividend of 7½ per cent.

The Glasgow Smoke Abatement Exhibition, which was to have been opened next month (September) has been postponed—many potential exhibitors being engaged in the manufacture of munitions.

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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Aug* 9.

There is nothing new to report in the London tar products market, and prices remain steady. Creosote is still in strong demand both for the home and export trade, and the price to-day is considered to be 4½d. net per gallon in bulk at makers' works. Benzol, solvent naphtha, and naphthalenes are also in good demand.

The value of sulphate of ammonia still remains at £14 8s. 9d. net per ton, filled into buyers' bags at makers' works, for 25 per cent. quality.

Tar Products in the Provinces.

Aug. 9.

The markets for tar products have remained fairly steady throughout the past week. There is very little new business to report in pitch. Buyers abroad expect to purchase at lower than the quotations which are being made at the present moment. Solvent and heavy naphthas are in fair demand, and prices keep pretty firm. Creosote is quiet, and sales are reported at very reasonable prices. Some business is reported in crude carbolic on the basis of 3s. 6d. to 3s. 7d. naked at makers' works.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 6d. to 25s. 6d. Pitch, East Coast, 22s. to 23s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. Clyde. Benzol, 90 per cent., naked, North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3d. to $3\frac{1}{16}$d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 6d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. to 2⅛d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

Liverpool, *Aug.* 7.

The paucity of new business and the difficulties experienced in making shipments against orders already booked have now had the effect of weakening the tone of the market, and during the past week lower prices have been accepted for near delivery. The closing quotations are £14 12s 6d. per ton f.o.b. Hull, £14 13s. 9d. f.o.b. Liverpool, and £14 17s. 6d. f.o.b. Leith. For October-March delivery, producers still require £15 2s. 6d. to £15 5s. per ton, according to port of shipment; but there are no buyers at these figures, and it is reported that middlemen are offering at 2s. 6d. per ton less money.

Nitrate of Soda.

The market for this article is firmer on spot, and holders now require 12s. 6d. per cwt. for ordinary quality, and 12s. 9d. for refined.

Sulphate of Ammonia.

From another source it is reported that there has been a slight lull in the market for this article during the past week. However, lower prices have not been heard of as having been accepted yet. Outside London, makes are quoted at £13 5s.; Hull, £14 15s.; Liverpool, £14 17s. 6d; Leith, £15; Middlesbrough, £14 15s.

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COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is active for prompt business; but forward sales are influenced by the expected effect of the new export regulations after the middle of this month. In the steam coal trade, the demand is at present steady. For best Northumbrian steams, the current quotation is from 21s. to 21s. 6d. per ton f.o.b.; second-class steams are about 16s. 6d. per ton; and steam smalls vary from 13s. to 15s per ton. Production is well maintained, and at present is taken up readily. In the gas coal trade, there is a slow increase in the local consumption; and the shipments to the South of England are good under the circumstances. Best Durham gas coals are generally quoted from 20s. to 21s. per ton f.o.b.; second-class qualities are about 17s. to 17s. 6d. per ton; and "Wear Specials" are steady at 22s. to 22s. 6d. per ton f.o.b. Deliveries on the long contracts appear to be sent out more freely; and though enlistment is still lessening the number of the miners, their work is more regular generally for those remaining in the industry. Coal freights are rather easier, with a basis of about 7s. to 7s. 1½d. for gas coal from the Tyne to London. Coke is steady and is not plentiful. Gas coke seems in good demand, and the quotation is about 27s. per ton f.o.b. in the Tyne. Some producers are also raising the local price for good makes.

Littleborough Gas Company.

The half-yearly meeting of this Company was held last Thursday—Mr. J. C. Hudson in the chair. A dividend of 10 per cent. per annum (less income-tax) was declared. The net gas sales increased in the last six months from £4742 to £4986; and residuals realized £1582, compared with £1505 last year. The revenue profit (£1336, against £1384) was considered satisfactory, in face of the abnormal conditions in prices of raw material and costs for labour, rating, &c. An increase of 2 million cubic feet (5½ per cent.) was reported; and half of the increase was said to be due to the extended use of gas fires and cookers, and also prepayment meters. Since a cash discount was allowed for slot consumers, the average consumption per meter has shown a satisfactory increase, and the summer consumption has more than doubled since 1905. The gas made during the past twelve months was 81 million cubic feet, compared with 78 millions last year, and 47 millions ten years ago. The shareholders expressed their satisfaction, and thanks were accorded to the Directors, to the Manager and Secretary (Mr. S. E. Halliwell), and to the staff.

Sidmouth Gas-Works Results.

At a meeting of the Sidmouth Urban Council last Tuesday, the Chairman reported that they had completed the first year's working of the gas undertaking under the Council; and, from their standpoint, the concern had, as nearly as possible, lost £1000. This statement, however, needed qualification. Principal had been repaid to the extent of £600 on the long loan of 35 years; and in the £1000 they had also to allow for the repayment of £425 on the short loan. Personally, he thought the undertaking would have shown a very different result had it not been for the position they were placed in owing to the war. He understood that, owing to the increased cost of material and the smaller price of tar, they had lost £380. Besides this, they had the further loss of gasconsumption. If these things were considered, they would not find much cause for discouragement. He did not think, however, that it would be businesslike for the Council to go on after this year without making some sort of charge on the rates to keep the undertaking going. The expenditure in connection with the works would be cut down wherever possible. He believed the crisis in connection with the gas undertaking was passed, and that in the coming year, with the increased number of slot-meter consumers, the results would be very different.

Lincoln Gas Coal Contracts.

Some information relative to coal contracts was forthcoming at a meeting of the Lincoln City Council, last Tuesday evening, when Mr. Taylor directed attention to a paragraph in the report of the Gas Committee which set forth that the Manager (Mr. W. H. Mainwaring) had reported that if the Corporation would release the Sheffield Coal Company from their obligation to supply 770 tons of coal under their old contract, the Company were prepared to reduce the price for the supply of 2000 tons of coal under the proposed new contract by a certain sum per ton less than that stated in their tender. The Committee had decided to accept the offer; but Mr. Taylor desired to ascertain from the Chairman his view as to whether a new situation had not been created by the Bill for limiting the price of coal. He thought the Lincoln ratepayers were under an obligation to other municipalities for having been a little more energetic than their own representatives in bringing pressure to bear in relation to the coal question, and prevailing upon the Government to bring in such a Bill. Alderman Wallis (the Chairman of the Committee) replied that he did not think the Government Bill would make the slightest difference to the arrangement their Gas Committee had entered into. His own view was that the Council had acted very wisely in the course which they had taken in buying coal. He should have been sorry if they had been among those who recommended that no contracts should be entered into, and that they should wait to see what the Government intended doing. Those who had not purchased coal were likely to find themselves in a difficulty later on. The arrangement proposed was a good one, and would turn out satisfactorily to the Corporation.

The South Suburban Meter-Rent Fiasco.

Under the heading of a "Scheme that Failed," the "Star"—the London paper that led the recent agitation against the suggested raising of meter-rents in the South Suburban Gas Company's district—last Wednesday, wrote as follows: The Directors of the South Suburban Gas Company, disappointed in their contemplated raid on meter-rents, have issued a delightful circular to their customers. It is as follows:—

> METER-RENT.
>
> I am desired by my Directors to convey their thanks to the great number of consumers, who by signing the new agreement have recognized the fairness of the proposed advance on the present charge for meter-rent.
>
> A relatively small number of consumers have, however, objected; and the Directors do not now propose to make the change.
>
> By order of the Board,
>
> WILFRID WASTELL, Secretary.

We ["Star"] have no means, of course, of checking these statements; but if the great number of consumers have recognized that it is fair their meter-rents should be doubled without notice, they are more guileless than we should have expected. As to the "relatively small number of consumers" who have objected, that again we take with a grain of salt. The Directors do not propose to make the change simply because they can't. As the "Star" pointed out at the beginning, the consumers had the matter in their own hands; and if they refused to sign the artful circulars, the Company could not raise the meter-rents. No doubt it was anticipated that this little scheme would go through quietly while people's minds were being concentrated on the war. But the scheme has failed.

War Bonus Question at Oldham.

Recently it was reported [*ante*, p. 45] that the Special Committee of the Oldham Corporation appointed last March to consider applications which had been submitted by the Municipal Employees' Association and the Gas Workers' Union for an all-round advance of wages to be made to cover the extra cost of living, had re-affirmed their decision not to recommend the Council to grant war bonuses. They pointed out that the applications had previously been refused on the grounds that, generally speaking, the Corporation employees received quite as good wages as, if not better than, were paid by private employers in the town; that they were in receipt of regular weekly wages with practically no deduction for compulsory short time; and that if the increase was given it would have to be borne to some extent by many ratepayers who were not as well circumstanced as the Corporation employees. At a mass meeting of the employees last Monday week, it was practically unanimously agreed to press forward the original claim for 5s. per week advance, though it was hinted that something less than this would be accepted. Mr. J. R. Clynes, M.P. (the General Secretary of the Union), was urged to demand an early settlement of the question or arbitration. Failing this, it was announced that strike notices would be tendered. On Wednesday, Mr. Clynes despatched a letter to the Town Clerk, in which he expressed willingness to leave the matter to a decision of a town's meeting; the writer giving an undertaking that no Corporation men should attend it. A step in the direction of a peaceful settlement of the question was taken on Thursday night, when a special Council meeting was held, and it was decided to invite Mr. Clynes and a small deputation to attend a further meeting of the Special Committee on Thursday next, to further consider the question. This is regarded as promising for a settlement of the whole matter.

Proposed New Water-Main at Plymouth.

Mr. F. Howarth, the Water Engineer to the Plymouth Corporation, has presented to his Committee a report on the necessity of proceeding immediately with the execution of the scheme for increasing the means of conveying water to the borough. The question has been before Parliament in the present session; and the necessary powers have been given. Mr. Howarth points out that the carrying capacity of the existing 25-inch trunk main, from the Burrator storage reservoir, which was laid about twenty years ago, has been reduced by incrustation from 7¾ to 5¾ million gallons per day, or a reduction of over 25 per cent. There is a second main which forms part of the late Devonport Corporation Water-Works. This will carry 5 million gallons. But the supply available for it is dependent upon the dry weather flow of the rivers by which it is fed; and the average summer flow is estimated at about 2¾ million gallons per day. In a dry summer the deficiency will reach 2 million gallons a day; and as the storage available in the service reservoirs near the town is only 50 million gallons, there is grave risk of a water famine. In estimating the needs for which provision should be made, Mr. Howarth says that thirty years is the shortest period which should be considered. The population of the district within the limits of supply will by that time be about 300,000; and at the present summer rate of consumption (47·8 gallons per head), the requirements will be 14,340,000 gallons per day. A pipe-line across country alongside the existing 25-inch main, a distance of 4⅓ miles, could be in operation in about nine months; and as no time should be lost, Mr. Howarth favours this plan. He suggests that the diameter of the new main shall be 33 inches, which will carry, when new, 14½ million gallons per day. The cost is estimated at £59,340. A term of sixty years has been granted by Parliament for repayment; and the Treasury have sanctioned the raising of the money, provided the Corporation do not go into the open market for it, but use their own sinking funds.

Street Lighting at Hoddesdon.—It was reported at a meeting of the Hoddesdon Urban District Council that a tender had been received from the Gas Company for the lighting of the street-lamps from the 1st inst. to May 31, 1916, inclusive. The price was £2 7s. per burner, with an additional charge of £2 4s. per burner for any lamps lighted the whole of the night all the year to July 31, and a charge of 11s. 3d. per burner for each lamp lighted during the months of June and July. A proportionate deduction would be made in the case of lamps not being lighted. The offer was accepted.

Rathmines Gas Lighting.—At a meeting last week of the Rathmines (Dublin) Urban Council, it was recommended by the Lighting Committee that a contract be prepared embodying terms to be agreed to by the Alliance and Dublin Consumers' Gas Company for the alteration and repair of lamps at 16s. 3d. each, with a maintenance fee of 25s. per lamp; the charge for lighting to be £2 2s. per annum, and the contract to be for three years, with 350 lamps as a minimum number. Mr. Carruthers (the Chairman of the Committee) explained that under the old contract they paid £2 10s. per lamp for 4000 hours, and under the new contract the charge for a like number of hours would be £2 18s. The Committee, however, desired to economize, and thought they would only light the lamps for 3000 hours, so reducing the cost to £2 2s. After discussion, the matter was referred back for further consideration and report.

Cambridge University and Town Gas Company.—Notwithstanding a large drop in the receipts from public lighting, the Company have had a successful half year; the Chairman (Mr. E. H. Parker) pointing out, at last week's meeting, that the consumption of gas was greater by 9½ million cubic feet than in the corresponding period of 1914—the increase being largely due to the presence of troops in the town. Of the 52 employees on active seraice, two have been killed, two wounded, and one is a prisoner. New coal contracts have been made at an advance of 6s. per ton, which accounts for the increase in the price of gas which the Board have been compelled to make. In emphasizing the debt the Company owe to the Manager (Mr. J. W. Auchterlonie), the Chairman said they had every confidence that each difficulty as it arose would be successfully overcome by his ability and care, assisted by an excellent staff in all departments. The report was adopted; and a dividend at the usual rates was declared.

Devonport Gas-Works Profit.—A statement of the result of the working of the gas undertaking at Devonport for the year ended March 31, was presented to the Plymouth Corporation Gas Committee last Thursday. The gross profit was £22,019, and the net profit £4122, compared with £21,115 and £2710 in the preceding year. The Committee decided to carry the net profit to the reserve fund.

Wolstanton Gas Undertaking.—With an increase in the quantity of gas made last year at Wolstanton of 134,000 cubic feet, there was a reduction of 46 tons in the quantity of coal carbonized. A lowering of the price of gas and diminished returns from residuals resulted in a drop of £314 in revenue; the gross profit falling from £5535 to £5227. In a period of seven years, about 30 per cent. of the loans have been repaid. At the May meeting of the Gas Committee, it was decided to increase the price of gas 2d. per 1000 cubic feet; but in his report the Manager (Mr. J. H. Woolliscroft) expresses the opinion that there was no need to take this course.

Increased Charges at Kensington.—The Works Committee of the Kensington Borough Council have considered a letter received from the Gas Light and Coke Company, stating that the price of gas supplied to the public lamps has been increased from Lady-day 8d. per 1000 cubic feet—that is, 2s. 2d. to 2s. 10d. Under the provisions of the Statutes governing this matter, the Committee remark, the price for gas for street lighting purposes in the borough cannot be higher than the charge for gas supplied to private consumers in the area of the South Metropolitan Gas Company. The latter charge was increased from 2s. 4d. to 2s. 10d. as from the meter-readings at Lady-day, so that the Gas Light and Coke Company, in increasing the charge for gas supplied to the Council's street-lamps from 2s. 2d. to 2s. 10d , are levying the maximum amount they are entitled to charge.

Exmouth Gas Company and the District Council.—A dispute has arisen between the Exmouth Gas Company and the Urban District Council as to the charge for public lighting; the Council claiming a deduction from the account on the ground that certain lamps were not lighted owing to restrictions imposed by the military authorities. A Committee was appointed to confer with the Directors of the Company. The Directors were, however, unwilling to meet these gentlemen, because they were not given power to settle the matter, but only report the result of their interview to the Council. As an alternative, the Directors suggested that the charges should be referred to the arbitration of a competent accountant; and they invited the Council to nominate persons possessing the necessary qualifications, one of whom might be chosen as Arbitrator. This was considered by the Council at their meeting last week; but on the recommendation of the Finance Committee it was not entertained. The Directors had informed the Committee that they did not expect to be paid for gas which had not been consumed; and the Committee recommended that the account be returned to the Company, and that they be asked to amend it in accordance with existing conditions. It was decided that this course should be taken, and that the Committee have full power to act.

Women Meter-Index Readers.—The August number of the "Co-Partnership Journal of the South Metropolitan Gas Company" has as a frontispiece a reproduction of a photographic group of fifteen women workers as meter-index readers in the Company's various districts. Referring to the group, it is mentioned that, in consequence of the absence on Imperial Service of nearly two thousand co-partners, it was, after careful deliberation, determined to have recourse to "female labour for certain work for which the special faculties of the sterner sex are not needed." It is stated that these women employees do their work efficiently and tactfully, and are well received by the consumers.

Grantham Gas Company.—Mr. J. G. Thompson, who presided at the half-yearly meeting of this Company, referred to the abnormal conditions created by the war, and difficulties entailed by the enhanced price of coal. The accounts showed a balance of £2922; and out of this sum the Directors recommended the payment of a dividend of 5 per cent. per annum (less income-tax), carrying forward the surplus. The increase in the price of coal and of other requirements of the Company, coupled with the decrease in the value of tar and ammoniacal liquor, rendered it necessary to augment the income of the Company; but regarding it as possible that the great increase in the price of coal might only be of a temporary character, the Directors proposed, instead of raising the price of gas, to charge the consumers temporarily with a war premium to the extent of 10 per cent. on their accounts, this charge to commence on Oct. 1. The report was agreed to.

Wandsworth, Wimbledon, and Epsom District Gas Company.—The Directors will report at the half-yearly meeting of the Company next Tuesday that, for the six months ended June 30, the revenue account shows a profit of £30,120. After providing for the interest on debenture bonds and stocks, and on deposits and loans, there remains to the credit of the profit and loss (net revenue) account, with the addition of the balance brought forward, an amount of £23,641. The Directors recommend that dividends be declared at the statutory rates as follows: On the Wandsworth "A" stock, £7 17s. 6d.; on the Wandsworth "B" stock, £6 7s. 6d.; on the Wandsworth "C" stock, £5 10s. 3d.; on the Wimbledon stock, £5 15s.; on the Epsom stock, £6 7s. 6d.; and on the new ordinary stock, £5 10s. 3d. per cent. per annum. The decreases in the rates of dividends are due to the increase in the price of gas in accordance with the sliding-scale. These dividends absorb the whole of the balance, together with £5050 from the reserve fund. The Directors regret to report that they have had to increase the price of gas by 4d. per 1000 cubic feet from Lady-day, 1915. This increase has become necessary by reason of the higher prices paid for coals under the new contracts, the difficulty of obtaining due supplies, the advanced prices of all materials, the extra cost of labour, the large war bonus payments, and allowances to dependants of employees serving with the Colours. The sale of gas in the half year shows a small decrease of 0·8 per cent., compared with the corresponding period of 1914.

Careful attention will be given to YOUR enquiries.

R. & J. DEMPSTER, Ltd.,
MANCHESTER.

London Office:
165, Gresham House,
Old Broad St., E.C.

Price of Gas at Pontefract.—The accounts of the Gas Committee of the Pontefract Town Council for the year ended March 31 showed a profit of £535; and the Committee recommended that the price of gas be increased from 2s. 11d. to 3s. 3d. per 1000 cubic feet. The Chairman (Mr. C. Pease) stated in the Town Council that this was calculated on the cost of coal being increased by 6s. a ton; and on the Mayor pointing out that the rise would be limited by the new Act to 4s., the proposal was referred back to the Committee.

Increase of Price at Wantage.—Reporting at a meeting of the Wantage Urban District Council, the Gas Committee, owing to the increased cost of coal and labour, recommended an increase in the price of gas, to take effect from Oct. 1, of 5d. per 1000 cubic feet. In moving the adoption of the report, Mr. A. J. Belcher remarked that the Committee were sorry, having reduced the price of gas, to find that they were compelled to make another increase. The fact was they had to pay 5s. per ton extra for coal, which meant a cost of £400, equalling 7½d. per 1000 cubic feet. If the Government stepped in and lowered the price of coal, they would again recommend a reduction. The report was adopted.

Bolton Gas Committee and Employees' War Allowances.—There was a long discussion at the monthly meeting of the Bolton Town Council regarding employees of the Corporation obtaining permission before they enlisted. It arose out of a decision of the Gas Committee not to give any allowance to the dependants of one of their workmen who had enlisted, because he had not received the permission of the Gas Engineer (Mr. W. Smith). Alderman Horridge explained that the man in question joined the Colours after hearing him (the speaker) make an appeal for recruits; and because he had not obtained the permission of the Engineer, his wife and children had to go without the Corporation allowance. He considered that the Committee were retarding recruiting; and he moved an amendment that the man be given the allowance. In the course of the discussion it was repeatedly pointed out that the Council had decided not to grant the allowance unless permission to enlist had been granted. The amendment, however, was carried.

Sale of Shares.—At a local auction sale last week, Mr. F. W. Baker offered 500 additional £10 shares in the Frimley and Farnborough District Water-Works Company. The total amount realized by the sale was £7351; the average price per share being in the neighbourhood of £14 14s.

Helston Street Lighting—Reference was made at the last meeting of the Helston Town Council to correspondence which had passed between the Council and the Gas Company on the subject of the account for public lighting. The Council claimed a reduction in the charge owing to the lamps being unlit; and the Manager of the Company (the late Mr. John Gill) offered to allow £1 5s. per week for 32 weeks. This was considered inadequate by the Council; but the present Manager (Mr. S. J. Ingram) gave details as to the cost of gas, maintenance of lanterns, &c., and expressed the opinion that Mr. Gill had been most generous in his offer. The Surveyor said he estimated that the actual saving to the Company was £2 per week, which would amount to £64 for the 32 weeks, against £40 offered by the Company. It was decided to appoint a Committee to arrange matters.

Lighting Matters at Cheshunt.—At a meeting of the Cheshunt Urban District Council, it was reported that the Gas Company had, in view of the deterioration of the lanterns and burners left in the street-lamps not lighted, applied to the police authorities to allow all public lamps to be lighted in the usual way, provided the tops and three parts of the side-glasses were blacked-over. The Commissioner of Police had, however, replied to the effect that, from a police point of view, the present lighting met all requirements. The Surveyor said he had seen the Gas Company, and discussed whether, considering the amount paid for public lighting and the number of lamps not lit, any of the work done to the lamps could be dispensed with, and, if so, what rebate the Company would be prepared to make. Only 46 of the 348 lamps in the district were lighted. The allowance of 1s. 9d. per lamp per quarter offered by the Company would amount to £26. It was suggested that the Company should be allowed to remove the lamps, burners, &c.—the Council giving storage facilities free of charge. The Company are to be further approached.

GAS COMPANIES IN THE STOCK EXCHANGE.

Upon the Stock Exchange last week the general tone was fairly good, and seemingly it was unaffected by the news of the fall of Warsaw. The chief interest lay in the opening of the market to dealings in the War Loan *ex* conversion rights. Considerable advantage was taken of this opening, and the aggregate of transactions fully came up to previously formed expectations. The price at the close of the first day was 98¼; and it varied but little—being about 98⅛ at the finish of the week. In the other markets, the prominent features were the continued weakness of Home Rails, and, on the other hand, the advance of Americans. South Africans and Foreign exhibited some good points; while, among the Miscellaneous group, concerns dealing in anything contributing to munitions and appliances of war (especially some Canadian undertakings) were in excellent demand. An incident in the Railway Market was the issue of the North-Western Company's prospectus inviting subscriptions for £1,500,000 of 4½ per cent. preference stock at 96, redeemable at par in 1925—an attractive offer. Business in the Gas Market was of the most meagre proportions; the bargains recorded being too few in number to call for a daily detail. The figures realized showed for the most part no change. But in illustration of how much hap-hazard there is in these bargains where no minimum price exists, it may be noted that a parcel of fully secured debenture stock of a Metropolitan company was sold at about a 5½ per cent. price, while the ordinary 5 per cent. maximum stock of a provincial company was done at par. The South Metropolitan Gas Company are offering £100,000 ordinary stock to consumers at 82, which, at the present statutory rate of dividend, will return 5⅝ per cent. for money. This seems a tempting offer. In the Money Market, there was a good demand, coupled with an ample supply, and discount rates were easier. Welcome is the action taken recently by the banks in being less lavish with gold over the counter to the public. The conservation of the country's gold and the rigorous substitution of notes is a necessity.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING AUG. 7.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	..
374,000	"	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7½	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	..
50,000	10	Feb. 26	16	Bournemouth Gas and Water 10 p.c. . .	29—30	5 6 8	..
873,480	10	"	7	B 7 p.c. .	15—15½	4 10 4	..
95,000	10	"	6	Pref. 6 p.c.	13½—14	4 5 9	..
—	—	—	—	Deb. . .	..	—	75—75½
880,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	98—98½
830,000	"	"	11	Do. New . . .	204—209	5 5 3	..
50,000	"	"	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
206,250	"	June 11	4	Do. 4 p.c. Deb. .	91—93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	"	"	8	Do. A Ord. Stk. .	154—159	5 0 8	..
530,000	20	Mar. 26	12½	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	Do. 4½ p.c. Pref. .	4—6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	89—89½
560,000	"	"	5⅓	Do. 3½ p.c. do. .	103—105	5 1 6	..
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	55
800 000	Stk.	"	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	"	"	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	Derby Con. Stk. . . .	123—125	4 16 0	..
55,000	"	—	4	Do. Deb. Stk. .	102—104	3 16 11	..
,002,180	10	July 29	10	European, Ltd. . . .	17½—18	5 11 1	..
,362,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke 4 p.c. Ord. . .	98—102	4 15 6	80—81½
,600,000	"	"	3½	3½ p.c. max. .	76—79	4 8 7	..
,062,235	"	"	4	4 p.c. Con. Pref.	96—99	4 0 10	72
,674,850	"	June 11	3	3 p.c. Con. Deb.	72½—74½	4 0 6	60½—62½
130,000	"	"	10	10 p.c. Bonds .	..	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16¼—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c.	..	—	..
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C . . .	151—154	5 2 4	..
65,780	"	"	6⅜†	Do. B	115—118	5 8 0	..
65,500	"	June 26	4	Do. 4 p.c. Deb. . .	92—94	4 5 1	..
,940,000	Stk.	May 14	9	Imperial Continental .	150—160	5 12 6	..
,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c. .	119—121	5 7 5	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. A	211—213	4 13 11	..
718,100	"	"	7	B	146—14	4 14 7	..
306,083	"	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	—

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd. . .	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	98½—99½	4 10 6	85
529,705	Stk.	June 26	3½	Do 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	..
300,000	Stk.	May 14	8	Oriental, Ltd. . . .	117—122	6 11 2	100
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .	7¼—7¾	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B . .	128—131	4 19 [illegible]	..
100,000	50	"	12	Do. C . .	118—121	4 19 2	..
52,000	50	"	10	Do. D . .	..	—	..
249,980	5	April 29	8	Primitiva Ord. . . .	5½—6	6 13 4	..
499,960	5	June 26	5	" 5 p.c. Pref. .	4¾—5	5 0 0	..
521,600	100	June 2	4	" 4 p.c. Deb. .	91—93	4 6 0	..
—	—	—	—	" " " 1911	..	—	..
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 3	..
209,984	"	"	10	Do. B	222—224	4 9 3	..
523,500	"	"	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African . . .	10½—11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	83
1,895,445	"	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	60½—61
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	..
60,000	"	"	5	Do. 5 p.c. Pref. .	110—112	4 9 3	..
—	—	—	—	Do. West Kent. .	..	—	..
137,058	"	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord. . .	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c. .	135—138	5 8 8	..
742,275	"	"	6†	B 3½ p.c. .	115—117	5 2 7	..
181,255	"	June 26	4	4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	"	"	6⅞	" B 3½ p.c.	129—134	5 2 7	..
108,075	"	"	5/17/3	" C 3½ p.c.	110—115	5 2 0	..
352,000	"	"	6⅛	Wimbledon 5 p.c. .	117—122	5 0 5	..
98,000	"	"	6⅝	Epsom 5 p.c. . . .	121—126	5 5 2	..
88,416	"	June 26	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

* Ex Div.

East Ardsley Gas Company.—The report of the Directors of the East Ardsley Gas Company for the half year ended June 30 shows a profit of £534, and £1759 (including the balance brought forward) to be allocated. This is to be dealt with as follows: A dividend at the rate of 5 per cent. per annum, less tax, on the preference shares, and one of 7 per cent. per annum, free of tax, on the original capital stock—carrying forward £1272.

Burnley Water Scheme and the War.—The Burnley Corporation having asked the Local Government Board to sanction a further loan for the completion of the new water-works now in course of construction at Hurstwood, the Treasury intimated to the Town Clerk their desire that the Corporation should suspend the work until after the war. The Water Committee thereupon decided to ask the Board to receive a deputation on the subject of the urgency of the work and the desirability in these circumstances of sanction being given to further borrowing powers.

New Water Supply for Burbage.—The new water supply for Burbage (Leicestershire) was formally turned on by Mr. Charles Hands, the Chairman of the Water Committee, on Friday week last. Mr. Hands spoke of the necessity for an adequate water supply, and said the cost of the new scheme was estimated at £4400; but he was very pleased to state that the work had been carried out for £3700. He also referred to the satisfactory efforts of Mr. E. H. Crump in engineering the scheme; adding that the work had been in progress eight-and-a half months, and considering the difficulties the Contractors (Messrs. G. Greaves and T. Bradbury) had to contend with, it had been completed most satisfactorily. Had the work been postponed, the villagers would have had to pay considerably more than the actual cost. Mr. Hands then turned on the water, following which the Committee and friends sat down to dinner. Proposing "Success to the New Scheme," Mr. G. Cholerton (the Chairman of the Water Committee of the Hinckley Urban District Council) said, when he thought of the money his authority had spent in connection with the water supply, he was convinced that sooner or later the supplying of small communities with water would have to be undertaken by Parliament. Hinckley had spent something like £45,000 on the schemes. By taking the supply for Hinckley, one more link had been forged in the chain that bound the two places together. Mr. T. Powers (the Chairman of the Highways and Sanitary Committee of the Hinckley Rural District Council) afterwards presented Mr. Hands with a suitably inscribed stopcock as a memento of the occasion.

Mr. A. C. Willyams presided at the half-yearly meeting of the Truro Water Company, when accounts were presented showing a balance of £1281. It was decided to pay a dividend of 5 per cent., and carry forward £881. The Chairman said complaints had been made by consumers that the water had an unpleasant taste. Analyses showed that it was bacteriologically of the highest purity; and steps were being taken to remove the cause of complaint.

The Hebden Bridge and Mytholmroyd Gas Board have decided to advance the price of gas 3d. per 1000 cubic feet, and have delegated to the Finance Committee consideration of the question of insuring the gas-works and holder against damage by aircraft and bombardment.

At the last meeting of the Soyland (Halifax) District Council, it was reported that the Sowerby Bridge Council had intimated that the Local Government Board had refused to sanction the loan asked for to carry out gas improvements and extensions in Royd Lane; and therefore the work could not be proceeded with.

That the "Handbook of Patent Law of All Countries," by Mr. W. P. Thompson, Chartered Patent Agent, of No. 6, Lord Street, Liverpool, has reached a sixteenth edition, will be accepted as sufficient evidence that it has proved a useful guide to inventors; and if this applies to earlier issues, it should be even more true of the present edition, which has been completely revised. The subject is a big one, but it is treated in a simple and concise manner. The first section deals with Great Britain and Ireland, and the second with foreign patent laws. The compilation of the information contained in the latter section must have been a heavy task. Practice varies widely in different places—one of the extremes, apparently, being Hayti, where, we learn, "a patent can be obtained by a Special Act of Legislature." The book, it should be mentioned, is published by Messrs. Stevens and Sons, Limited, of No. 119, Chancery Lane, W.C.

The Manchester Gas Committee last Friday discussed the restricted lighting arrangements made by order of the military authorities. It was pointed out that the provisions for neighbouring towns permitted of better lighting than in Manchester; and a resolution was adopted that it was undesirable that the lighting order should be continued in its present form. A deputation was appointed to wait upon the Chief Constable with regard to the subject. The restrictions have naturally affected those shopkeepers who have had high and low pressure lamps fixed in their premises by agreement with the Corporation. Therefore, subject to consumers assenting to an extension of the periods of their agreements so as to ensure not less than three years' full use of the high-pressure lamps and one year's full use of the low-pressure lamps, as originally provided for, the Gas Committee have agreed to suspend all charges for the lamps in respect of the June quarter, and so long as they remain wholly out of use in consequence of the restrictions order.

APPLICATIONS FOR LETTERS PATENT.

10,834.—Willett, H. W. M., "Gas-compressors." July 26.
10,836.—Willett, H. W. M., "Gas-burners." July 26.
10,846.—Pickett, H., "Gas-lighter." July 27.
10,859.—Bromhead, H. K., "Water-heater." July 27.
10,881.—Allen, G. H., "Gas-producer plants." July 27.
10,935.—Ramsay, J. H., and Lowe, F. R., "Purifying gas." July 28.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Engineer. Romford Gas Company. Applications by Aug. 20.
Works Chemist. Birmingham Gas Department.
Mechanic. No. 6077.
Sulphate Maker. Peterborough Gas Works.
Main Tester. Devon Gas Association.
Fitters (Cookers). No. 6076.
Stokers. Winchester Gas-Works.

Plant, &c. (Second-Hand), Wanted.

Tower Scrubber and Coal Elevator. No. 6071.

Meetings.

Barnet Gas and Water Company. Holborn Restaurant. Aug. 30. 12.30 o'clock.
Brighton and Hove Gas Company. 5, Great Winchester Street, E.C. Aug. 27. One o'clock.
North Middlesex Gas Company. 5, Great Winchester Street. E.C. Aug. 30. 2.30 o'clock.
Riddings Gas Company. 139, Cannon Street, E.C. Aug. 27. Eleven o'clock.
Southgate Gas Company. 5, Great Winchester Street, E.C. Aug. 26. 3.45 o'clock.

TENDERS FOR

Coal.

Bradford Gas Department. Tenders by Aug. 30.
Clacton Urban District Council. Tenders by Aug. 18.
Limerick Gas Department. Tenders by Aug. 16.

Sulphuric Acid.

Peterborough Gas Company.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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ELECTRICITY, GAS, & WATER LEGISLATION.

Being a Comparison of the Provisions contained in the Model Bills, in Special and Municipal Acts, and in Provisional Orders, 1910 to 1914, relating to these Public Services.

Compiled and noted by JACQUES ABADY, of the Middle Temple, Barrister-at-Law.

WALTER KING, "JOURNAL" OFFICES, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

JOURNAL OF GAS LIGHTING & WATER SUPPLY.

Editor & Publisher: WALTER KING. Office: 11, Bolt Court, Fleet St., London.

VOL. CXXXI., No. 2727.] TUESDAY, AUGUST 17, 1915. [67th Year.

EDITORIAL NOTES.

The Course of Gas Legislation.

Members of Parliament are resting from their labours until the 14th prox.; and meanwhile the Cabinet and the Government machinery that has been created for the purpose are steering the country through what appears at the moment to be the almost interminable chaos of war and of the whole world's affairs. The gas industry has not this session done much to contribute to the exhaustion of the country's legislators; for the bundle of Bills deposited with Parliament some eight months ago was the smallest that has been known for many a long year—we might say, for many a decade. But, as usual, there were a large number of petitions presented against the Bills; and, as usual (perhaps more so this time), there was as much formality as any intention to fight in the act of lodging petitions. The consequence was that the Committee work has been of a slender order.

Nevertheless, it is rare that a session is so sterile that it does not produce some matters of interest. One or two points arose in connection with the calorific standard and clause. With few exceptions, promoters now ask for the calorific standard and test as a matter of course. But this session saw various promoters suggesting a level standard of 500 B.Th.U. (total heat value), instead of 540 B.Th.U., with 7½ per cent. margin. The Board of Trade saw no objection to the severance from the standard of the marginal limb; and Select Committees, as also the Unopposed Bills Committee, were guided by the Board. A point this session that dawned upon those who study legislation is that the industry must depend upon the Gas Light and Coke Company to see that the apparatus employed in making the standard calorific test is that which is most suitable for ascertaining the total heat value of the gas, inasmuch as they have the right, through their Act of last session, to have such apparatus prescribed by the Metropolitan Gas Referees, who have no jurisdiction outside London. But it has been stipulated in the model calorific clause that the apparatus to be employed is to be similar to that prescribed for the time being by the Metropolitan Gas Referees. The Dewsbury Corporation desired to have it put into black and white in their Act that they were entitled to the apparatus that was most suitable for ascertaining the total heat value of their gas. But the Local Legislation Committee, controlled by form, decided that the model clause must be adhered to, and the prescriptions of the Metropolitan Gas Referees followed. Uniformity, of course, is the object of this. There have been other signs of an intention to unify calorific value testing as much as possible. It is not a new clause which provides that promoters shall not be exempt from any future general legislation. But it has hitherto only made quite spasmodic appearance; while in this session both the Board of Trade and the Local Government Board have urged the necessity of its insertion in all Gas Bills, with a view, so it is said, of bringing promoters under any subsequent general legislation affecting calorific testing.

Capital questions have also had prominence. The inhibition of the Treasury as to capital-raising has, from the first, been present in the mind of the administration of every gas undertaking in the country. But the Treasury were timid lest the possessors of Acts passed during this session should take it that the new capital powers granted by Parliament subsequent to the Treasury notification opened to them the door to fresh issues without sanction. They therefore decided that hasp, staple, and padlock should be applied in the shape of a clause specially prohibiting the promoters from issuing any part of the capital without their permission. This supercaution was unnecessary, but quite harmless. The capital position of gas undertakings in war time has been brought before Committees on sundry occasions. Hard times have come, and they will be sterner yet, in respect of capital-raising. With the reduced dividends that are being paid by some sliding-scale companies, stock is being sold to-day at par, and much under in some cases. And as was pointed out in our first editorial article on July 6, the new 4½ per cent. war loan has set a new standard upon the earning power of money. It is only right that those in charge of gas undertakings should see what, if anything, can be done to get relief from statutory conditions which, under the present exceptional circumstances, act as a sort of barbed-wire fence to securing capital on the best possible basis.

The Ascot District Gas and Electricity Company sought to secure relief from the auction clauses for the space of years directly affected by the war. But form said "No," though immediately after the same Committee gave the Company permission to make greater use of their credit by raising the borrowing powers to one-half proportion, in place of the customary one-third. In the Northwich Gas Bill, the Company (it is a maximum price Company) obtained capital conversion powers on a 6 per cent. basis, as their advisers feel that a 5 per cent. basis would not be much good. Also with a view to giving small investors a better chance, and therefore increasing the sources of capital, the Spennymoor and Tudhoe Gas Company desired that the standard time for the payment for stock purchased under the auction clauses should be extended from three to twelve months. Again form said "No." A very useful Act will be the Statutory Companies (Redeemable Stock) Act; and this should not be overlooked. Then the Local Government Board seem anxious to get more uniformity in the loan-repayment periods granted in municipal Bills, with a reduction of the periods. They have tried this session to persuade Committees to leave the decision of the periods in their hands. Committees, however, have not seen fit to relinquish their duties in this respect; and divergent results obtain. The Doncaster Corporation asked for 40 years within which to repay money raised for the purchase of land, erection of gas-works, and the general purposes of the undertaking. They had the time reduced to 30 years in respect of £55,000, and to ten years in respect of £10,000 for meters, &c. In the case of the Chelmsford Gas Purchase Bill, the Local Government Board reported against the periods of 35 years for the liquidation of the purchase money, 40 years for new plant, 30 years for new mains, and 20 years for stoves, meters, and fittings. The Unopposed Bills Committee generously gave these periods, excepting the 20 years for meters, &c., which was brought down to 15 years, though in the case of Doncaster a period of ten years was considered ample by another Committee. While the Chelmsford Corporation were allowed 35 years for the liquidation of their gas purchase money, the Lurgan authority were given 40 years. The condition of works and other things theoretically come into the reckoning in fixing the repayment period; but, as a matter of fact, Parliamentary Committees are not in the position to apply such factors to their decisions. Hence the looseness that is witnessed session after session.

There is really little else to say about the session so far as gas legislation is concerned. The Chelmsford, Lurgan, and Skegness Purchase Bills passed. The Northwich Gas Company resigned their new works proposals in view of the opposition shown, and consented to remain a maximum price Company for some inexplicable reason. A purchase clause, after the lines of the Chelmsford one of the preceding session, was agreed to between the Company and the local authority. Electricity schemes brought forward gas companies in opposition. The large schemes of concentration for London were withdrawn, as the Government were not disposed to have time absorbed by contentious matters of such magnitude while the war continued. The Yorkshire Power Company who wanted roving lighting powers were sent home to attend to business on the lines of the powers already possessed, and were informed that Parliament were not prepared to grant them preferential rights. The Spennymoor and Tudhoe Gas Company have been given the right to hire-out dynamos in conjunction with gas-engines. The Plymouth Corporation have had their gas-fittings and hiring powers confirmed in respect of Devonport; and electrical powers on the same lines, existing as they did in Devonport, were granted by a Lords Committee in relation to the whole of Plymouth. But threatened further opposition by the local contractors in the lower House led to an agreement for the application of the model clause, with its limitation of liberty in connection with wiring and dealing in electrical fittings. The Northumberland clause was obtained in respect of an extension of the electric supply area at Southampton, though, in the special circumstances, it was refused by the Board of Trade and by the first House before which the Order came for confirmation. There will no doubt be further interesting points to extract from even this lean session's work when the Acts are at command.

Altered Conditions and Policy.

The Chairman of the South Metropolitan Gas Company (Mr. Charles Carpenter, D.Sc.) did not, at the meeting of the proprietors last Wednesday, spend any time over making comparisons of the working and financial results of the past half year with the corresponding period of 1914, although had those proprietors who have a facile way of putting inquiries which have not much value attaching to them been technically capable, they could have discovered some points in the accounts in regard to which interesting information could have been elicited, if interrogatories had been qualified by the admission that one must not in disordered times, and working under irregular conditions, expect normal results. And gas undertakings have had much to face in the past half year which—not only in the financial, but in the working, results—have had a repressing influence upon the attempts to work up to the best standards of the past. All standards and guiding rules of administrative policy, as well as of ordinary working, have indeed been disturbed; and the Chairman's address to the proprietors was a succession of illustrations of this. The vein of explanation running through the address was not by any means intended as an excuse. No excuse was necessary. For many years regular working, regular price of gas (the lowest charged by the three London concerns), regular dividends, and a record of pioneer work put the Company beyond the call for any apologetic utterances from the chair. But what Mr. Carpenter desired to impress upon the proprietors was that new conditions had created new standards; and that these were not merely products of the war, but had their roots in anterior time. What the war has done has been to heavily accentuate the conditions, and so has established new lines of policy.

Making allowance for all the palpable changes that have been creeping over the conditions affecting the industry prior to the war, the administrations of gas undertakings would have been superhuman who could have foreseen the vastness of war and the contingencies into which life and the world's affairs were to be precipitated. The accentuation of the changes by the war has been the means of creating new precedents. Never again must it be that this country is allowed to suffer from the lack of coal supply while coal is going out of it at the rate of many tens of million tons per annum. The argument is present in mind as to the necessity for bringing into the country, through its produce, gold from abroad; but we also well know that it is not a good thing that the industries of this country should be generally crippled for coal, and the country's industrial prosperity be prejudiced and depreciated by high prices, while coal is going across the sea largely to feed trade competitors. Since the war started, certain gas undertakings have been close upon the rocks for the want of coal—the South Metropolitan with the others; the same gas undertakings to-day (the South Metropolitan among them), through the regulation of exports, are filling their stores, and making use of additional ground for stacking purposes in preparation for what threatens to be a very difficult winter. This is one of the changes that has taken place in the standard of administrative policy. Long, however, before the war was thought of, a condition had arisen through labour unrest which caused the standard of coal storage to be raised; and difficulties of coal delivery and vagarious supplies had caused the cry for export regulation to be raised more than once by Mr. Carpenter, as well as by others. What has now happened is not due to a plea pertinent only to the war, but to something antecedent.

While, however, coal storage is greater, prices are heavier; and, consequently, the coal placed in store means a larger expenditure of working capital which is lying idle as coal as long as the latter has to be kept in store. This is another change. Yet a further one to which Mr. Carpenter pointed is that, whereas in the old time the Company used to take their heaviest deliveries during the period of largest consumption—that is to say, during the winter time—they now, as a precaution against eventualities, take heavy deliveries during the summer in order to get supplies well in hand, and this lengthens the duration of storage. The putting of coal into store and the taking of it out again also cost money. Expenses increase; but safety must predominate in administrative policy. All this reacts upon the financial position; and where there is not a large balance of undivided profit, one to-day finds loans from bankers standing at an inordinate amount. It is so in the case of the South Metropolitan Company; and the Directors in order to reduce the loan are now making an issue of new capital to consumers and employees. Change begets change.

Reverting to the price of coal, the Chairman pointed out that those gas administrators who reckon on the expectation of past experience recurring—experience which encouraged a confidence that if in one year the price of coal went up through exceptional circumstances, it would be back again the next year—were now building on the sands. The fact stands out boldly that, before the war, the gas industry had been suffering continuously for three-and-a-half years from high coal prices, without any sign whatever of substantial relief. Then came the war, and the excessive prices due to it; and we know what has happened in connection with coal price regulation under the new Act. Mr. Carpenter, like other chairmen of gas undertakings, recognized in his speech the good work that Parliament has done in this respect; for, although the Act means dear coal for the length of the war and a period after, it does put undertakings engaged in public services, with the obligation upon them of pre-arranging the prices for their prime commodity, in the position to make their estimates by knowing the worst, and by having protection against awkward flights in the cost for their principal raw material. It does, as Mr. Carpenter intimates, seem totally unfair that gas concerns, with prices and dividends limited by the Legislature, should have such an unstable foundation for their operations as an unregulated price of coal. However, Parliament has realized that something must be done to defend the country against a condition of ungoverned profit-grabbing on coal; and it is hoped that good effect will come from what has been done, not only during the present strain, but through the lesson that the passing and operation of the Act provide for those the Legislature felt bound to put under restraint in their dealings. It is a pity that some limitation was not applied to the rates of freight. There are admittedly difficulties in the way; but, as was shown by an editorial article last week which gave the actual additional war costs incurred by gas companies in running their own boats from Newcastle to London, the freights that have been demanded and obtained have had a margin of profit attached to them to the fixing of which only the factor of greed has been applied. The South Metropolitan Gas Company have now become ship-owners; and the Chairman frankly acknowledged that probably the Directors had erred by not placing the Company in the position of owners before this. There were satisfactory reasons for delay; but past policy in this respect is not going to be the rule for the future. Never again will the Directors rely on other people carrying their coal—at any rate, that is the present determination.

The Chairman also spoke about the effect of the war upon residuals; he gave the proper reply to those persons who have thought there should be a restriction of profits on residuals; he spoke of the employment of temporary female labour to help to compensate for the loss of men, and of the gratifying reports relative to the change; and he hinted at the probable appearance of the Company in Parliament with a Bill for the purpose of consolidating their parliamentary powers and regularizing certain matters to make them fit the changed circumstances of to-day. The prohibition of stock issues to proprietors at under par—unconditional on high prices of materials preventing gas being sold at low prices, and so bringing the dividend down below the standard set by a Government backed 4½ per cent. security—now requires amendment; and the Directors will probably consider the possibility of altering the sliding-scale provisions, so that the average of the ordinary price (and not the highest charge) for a half year is taken in fixing the amount of dividend to be paid. It seems unfair that, when the price of gas has been at the old figure during three months out of six, the proprietors should be deprived of all advantage by the raising of the price during the second three months.

The address took the proprietors over much ground in relation to which there has been change; and it shows us how largely, added to much change that has preceded, administrative policy has been forced by external circumstance to remould itself.

Retrograde Widnes Councillors.

The Widnes Town Council have pledged themselves to a retrograde movement; and we hope the ratepayers, or, if not the ratepayers, Parliament, will defeat it, and keep the Council in the straight way that has placed the gas concern (supplemented by able management) in the premier position in the matter of gas prices, and has given to the undertaking financial stability second to none of its kind in the United Kingdom. Widnes has been a model to other local authorities of what should be the policy in the municipal conduct of a public trading service. It is a policy that has done so well for the borough in the past that we trust it will be continued, and without any qualifications attaching to it. To put the matter quite briefly, the Council have, at the instance of the Finance Committee, and with the "blessing" of the Chairman of the Gas Committee (Alderman H. S. Timmis), agreed to invoke Parliament to amend section 102 of the Widnes Improvement Act, 1867, and permit profits to be allocated in aid of the rates. The people of Widnes not long ago were opposed to the vicious policy of indirect and inequitable taxation through the gas consumers, and so helping to relieve the rates of those who are not consumers; and we hope that, if good sense in this matter has forsaken the Council, the gas consumers will see to it that their erring representatives are again put on the right path, and in a manner that will act as a warning not to go astray again.

The councillors who have plotted this move, however, with the past experience before them, are adopting new strategy. They are now dangling before the gas consumers a conditional profit-appropriation, with the view of appeasing them. They say we will, out of the gas profits, pay for maintenance and improvement of the undertaking, provide for interest and sinking fund, and build-up a reserve fund. There is nothing new in this. It is precisely what every local authority has to do under statutory instruction before touching profits. Then comes in Hindenburg's move to get his military claws round Warsaw—the Hindenburg of Widnes being Alderman S. Owens, the Chairman of the Finance Committee, and Warsaw is represented by the gas profits. The clever ruse is that, if and when gas costs the ordinary consumer in the borough more than 1s. per 1000 cubic feet, then the amount of profits to be taken in aid of the rates should not exceed £2500 in any year. "What "could be fairer?" blandly asks Alderman Owens. Our reply is to leave things as they are. Why should a tax of even £2500 a year be put upon the gas consumers who have liquidated capital and discharged interest obligations without recourse to the ratepayers, who have found the money to maintain and renew the works, and who have paid the rates and taxes upon the undertaking? This being so, what moral right have the ratepayers (*quâ* ratepayers) to any claim to benefit to the extent of £2500, or any other sum, from a condition of things which the gas consumers, with highly efficient management, have created? Let this be pointed out to the gas consumers: If they agree to this proposal, and the Council obtain power from Parliament, the power will be exercised; and the time will come when they will have to contribute annually £2500 at least to the rates over and above the part that the undertaking as a ratepayer already contributes. The matter should be looked fairly and squarely in the face by the consumers. It will be many a long day yet before coal and other materials requisite to gas manufacture will again be as cheap as in the past; labour is dearer; rates and taxes through the war are going, and have gone, up; and income-tax on the profits proposed to be taken will be heavy. There has never been a time, too, in the history of gas supply when the outlook for residual products, through increasing competition, was more nebulous than it is to-day; and the undertaking has now to compete with a cheap supply of electricity. All these new conditions affecting finance the undertaking will have to bear. The best management in the world cannot wholly avert them. Then what are the chances for the gas consumers of Widnes that the price of gas will for a protracted period to come, if ever, fall below 1s. per 1000 cubic feet? The price may have to be permanently higher, without a burden of £2500 a year upon it. Given the power—the consumers should mark this—there will be no preventing the price of gas permanently bearing the £2500.

There has been no Chairman of a Gas Committee whom we have held in greater respect than Alderman Timmis; and we know he will not object to a little plain speaking. He appears before us to-day, as we understand him, a confessed apostate in the matter of pure municipal trading —the municipal trading (which we have never opposed) that runs a public service in order to give the patrons a supply at the lowest possible price, consistent with financial stability, and without calling upon the ratepayers for support, and without contributing money (beyond the due of a fair legal rating assessment) to relieve the ratepayers of their obligations. He stands before us now the maker of one of the most illogical speeches that we have ever read on the subject of profit-taking for rate-relief. Alderman Timmis says he has not changed his view, that the unrivalled position of the Widnes gas undertaking is largely owing to an old Act which forbids profit appropriation for rate relief. Parliament and the Local Government Board will bear in mind this admission when, if the ratepayers permit the proposed Bill to go forward, they come to adjudicate upon it. He also suggests that he does not recede from the principle that profit appropriation is not correct. But, to help his friends, who are longing to handle from the gas profits £2500 a year, and more if possible, Alderman Timmis, like the old lady who found comfort in the "blessed" word Mesopotamia, finds refuge and excuse in the "blessed" word "expediency." We have searched through his speech for, in this case, any rational reason for giving "expediency" an ascendancy over correct principles, and have failed. He says: "We have to "face the fact that electricity has come to stay, and that it "is an illuminant and motive power which many manufac"turers require. The necessity for gas at a cheaper rate there"fore disappears." If this means anything at all, it is that the manufacturers who prefer electricity are to have it at a cheap rate, and are to be rewarded for not consuming gas by the gas consumers finding for rate-relief £2500 at least a year, by paying more for gas. In other words, the electricity-using manufacturers are to share in the rate-relief provided by the gas consumers, among others the prepayment gas consumers, many of whom are their own workmen. The people who propose this thing, the manufacturers themselves, ought to be thoroughly ashamed of such a position, and at once reject the proposal that they should be recipients of compulsorily extracted benevolence from the gas consumers. If the Bill goes forward, we hope to see Alderman Timmis in the witness chair interrogated on his speech in favour of the crushing of correct principles and the setting-up of a corrupt expediency.

The proposers of this scheme to "set back the clock" in the matter of proper policy in the management of municipal trading concerns, may take it for granted that the Local Government Board, who prohibited gas-profit appropriation in aid of the rates in the Potteries, and who helped to curtail the system at Salford and Oldham (where profit appropriation had previously existed) will, if the Bill goes forward, report against the scheme for a town where things have gone so well without profit taking, and which has given to the country such an excellent example of the good effect of pursuing the right course. The proposers may also take it for granted that Parliament, who, when Glasgow in 1910 asked them to confirm its unexercised power of gas-profit appropriation for the purpose of aiding and abetting in a changed policy, for answer annulled the power, will not set up the power for the first time where it has not been possessed. Parliament will unquestionably say that the Widnes gas undertaking itself supplies them with the best possible evidence that a wrong would be done in sacrificing upon the altar of an abstract expediency sound principles that have had as issue concrete beneficial results.

Analysis of the Metropolitan Gas Accounts.

The analyses of the half-yearly accounts of the Metropolitan and Suburban Gas Companies by Mr. F. J. Bradfield, the Secretary of the Commercial Gas Company, appear on later pages this week; and they will be found of peculiar interest both by comparing the results of the different companies, and by turning up the analyses for the corresponding half of last year to make contrast of the working under peace and war conditions. It is observed that on the past six months the Brentford production of gas per ton of coal carbonized—12,103 cubic feet—was the lowest of the seven companies whose accounts are explored; and the South Metropolitan ranked next with 12,180 cubic feet. The Commercial Company were on top with 14,019 cubic feet; the Gas Light and Coke Company made a good showing with 13,044 cubic feet; and the Wandsworth, South Suburban, and Tottenham Companies did well with respectively 13,426, 13,010, and 12,811 cubic feet. Looking at these figures, the time has about passed when anything less than 13,000 cubic feet from the coal used in London can be considered good working. The South Metropolitan Gas Company, according to the analyses, paid the highest price for coal per 1000 cubic feet—21·45d.; the prices paid by the Gaslight and Coke and Commercial Companies being, respectively, 15·73d. and 15·54d. The South Metropolitan Company did best in residuals per 1000 cubic feet—11·71d., as compared with 7·84d. by the Gaslight and Coke Company, and 7·12d. by the Commercial Company. The result is that the net cost of coal, oil, &c., for the South Metropolitan Company is 9·74d. per 1000 cubic feet; for the Gaslight Company, 7·89d.; and for the Commercial Company, 8·42d. The average cost of coal per ton was in the case of the South Metropolitan Company, 20s. 9·57d.; Gaslight and Coke, 19s. 4·35d.; Commercial, 19s. 4·91d. The tables are packed with interest—one other of the items being that the percentage of stoves at rental to consumers is 98 in the case of the South Metropolitan Company, 81 in that of the Gaslight Company, and 70 in that of the Commercial Company.

Saving Gas and Toluol Recovery.

The Parliamentary War Savings Committee advise the public to use as little gas and electric light as possible in order to save coal. The recommendation is pleasantly simple; but, so far as gas is concerned, it is not an economic one. The Committee ought to know what they are talking about, or rather ought to get proper advice themselves before acting as advisers to the public. Coal would be saved by using less electricity for lighting purposes; coal would be saved by using less gas for any purpose. But as the "Yorkshire Post" has been telling its readers—and it seems to be about the only daily paper in the country that has been sufficiently informed to call attention to the matter—the more the consumption of gas is reduced, the more restricted becomes the source of that absolute necessary to victory—toluol. Our Yorkshire contemporary does not mention that reduction of gas consumption also means the curtailment of the source of that necessary to the production of picric acid—carbolic acid; also that the smaller the consumption of gas, the greater the restriction of the source of the best qualities of sulphuric acid. The gas industry, in the production of these things, is acting very patriotically by not sweating undue profits out of the country—in fact, in connection with sulphuric acid, it is using (in order to give the Government what they require) an inferior quality itself, to the detriment—chiefly through a certain impurity, from which relief is being sought—of the appearance of its sulphate of ammonia. If the War Savings Committee had advised the people, as they have been counselled in Germany, to use as much gas as possible, they would have been doing the right thing. What should be altered is the crude consumption of coal for domestic purposes. The coal ought to be passed through the retorts at the gas-works, so as to save its constituents—the gas and coke only being used for fuel purposes. The treatment of the gas and other products would increase the supply of the ingredients for explosive manufacture that the country requires, as well as the bases of the dye colours of which there was such a threatened shortage not long since, owing to the disability under which Germany is labouring in the matter of conducting an export business as of yore. The "Yorkshire Post" had a little fall in supposing that the coke-oven plant owners were not doing a good part in connection with the recovery of toluol; and there were protests from that quarter.

The Sliding-Scale in War Time.

The sliding-scale system of price and dividend has, generally speaking, worked very well in connection with gas companies; but the war has projected a defect upon notice, which has hardly been observed before, or, if it has been, people have been content to let it go. But in recent times the price of coal has gone up considerably; and the price of gas has had to be raised by an amount which is rather impressive in an industry more accustomed to reductions of charge than to advances. The consequence is that the dividend has slipped back in some cases in uncomfortable measure. The high cost of coal is likely to persist for some time; and the price of gas must perforce—perhaps not keep up to quite the present height, but must be, in many cases several pence higher than before the war. Some of the companies who have been compelled to substantially raise their prices did not do so until April last. The sliding-scale has half-yearly, and in instances yearly, application; but let us take a half-yearly example. Under the terms of the sliding-scale, the amount of dividend is based upon the maximum price charged in the half year. The past half year illustrates the unfairness of this. The consumption of gas in the first three months of the June half year is, as a rule, much higher than in the second three months; and this larger supply the consumers obtained in many cases at lower price than ruled in the second quarter. But, under present circumstances, the proprietors obtain no benefit from the fact that the greater part of the supply was at the lower rate, owing to their dividend being based on the higher price charged in the half year. The question has been raised in certain quarters as to whether gas companies cannot secure an amendment of the provision, so as to have the dividend based upon the average price charged in a half year, instead of the maximum price. There is no inducement at present for a company who see a prospective advance is imperative to defer it from January to April or from July to September, or for a company who see the position is ripe for a reduction in price to make it in April or September instead of waiting till July or January. The average of the ordinary price in a half year seems to be a very fair suggestion. The matter was referred to during the proceedings at the meetings of the South Metropolitan Gas Company and the South Suburban Gas Company, both of which are reported this week.

In the Southern Suburbs.

The South Suburban Gas Company did well in their past half-year's trading under the adverse circumstances. They have had to raise the price of gas like most other companies owing to the exorbitant advance in the price of coals and the height of freight rates. Though dividends have been reduced in consequence, the proprietors, at the meeting last Friday, felt very satisfied with the position, and with the story the Chairman (Mr. Charles Hunt) had to tell. The troubles of the half year have compelled all chairmen and directors to devote an immense amount of time to saving the interests entrusted to their care from greater depreciation than was unavoidable. During the trying period, no Chairman has been more faithful to the trust reposed in him than has Mr. Hunt; and graceful acknowledgment of this was made at the meeting by Mr. John Boraston on behalf of the Directors. On one comparatively small point, there has been in our columns and elsewhere a little criticism in which the Board have had some interest. This was in relation to their scheme for unifying the meter-rents throughout the Company's area. The Chairman made a very frank statement on the subject, and told of the fair settlement now effected. The South Suburban consumers are to continue to enjoy their old flat-rate of 3s. per annum; and the Bromley and West Kent consumers are to come under a flat-rate of 6s. "All's well that ends well."

Dangers Ahead for Sulphate of Ammonia.

An unanswerable case for the whole number of sulphate of ammonia producers acting as one man through the Sulphate of Ammonia Association appears in this issue (p. 344). The matter is of supreme importance—more so than some producers seem to think. Sulphate of ammonia organization in this country has done wonders hitherto for home production; and this is seen by the single fact that the world's consumption of sulphate of ammonia rose from 250,000 tons in 1896 to 1,250,000 tons in 1913, with the price moving between £11 and £14 per ton, as against £7 to £8 when the Sulphate of Ammonia Committee first commenced their operations. But the work that lies before is of a sterner order than anything that has preceded in connection with sulphate of ammonia; and the case now presented lifts the veil and exposes certain things which, if there is not unity and definite purpose among the home producers, and a serious attempt to exercise a proper influence in the world's markets, will put us at the end of the war in a very precarious position in respect of this commodity. Several times we have shown what, preceding the war, the German producers were doing, by steadfast policy, in capturing the best of the overseas markets—those showing the greatest financial stability—and the success that by quality and price they were achieving in elbowing us out of these markets. Now we learn that German producers are not sitting still while war proceeds; it was idle to suppose they would do so. There is the neutral outlet; and the German Sulphate of Ammonia Syndicate have approached a firm of compatriots in a neutral country asking them to carry on their propaganda work there during the war. This does not look like a dormant state. Then a Bill has been introduced into the German Reichstag with the object of creating a commercial monopoly in nitrogen in Germany. This is due to the output of synthetic nitrogen and to the substitutes that have been found for nitrate of soda during the war, by which German nitrogen producers have made both German agriculture and industry (the explosive industry especially) independent of foreign supplies. The monopoly is being opposed by the Badische Company, who have stated that they will shortly be making per annum 300,000 tons of the synthetic commodity. This means, if the Bill passes, that the 800,000 tons of nitrate of soda which Germany used in 1913 will go begging round for other markets. Competition will come not alone from Germany, but from other producers—including those making cyanamide (nitrolim) and Norwegian nitrate of lime. Home producers must be prepared for the conditions that will, with certainty and in strength, come upon us in this market when peace is declared.

A Silly Anonymous Query.

It is not our custom to pay attention to anonymous communications. As a rule, such missives have speedy transference from envelope to waste-paper basket, which is the proper destination for communications to which writers have not the courage, or are too cowardly, to append their signatures. But we have an anonymous inquiry this week from a person who obviously does not know the facts of the matter, and so out of sheer pity for him we give an answer to his main points. He writes his inquiry upon the side of p. 234 of the "Journal" for the 3rd inst., evidently adopting this course with the intention of further covering his tracks. On that page, it was pointed out that a rise of 1s. per ton in the price of coal represented about 1d. per 1000 cubic feet of gas made, and that 1d. on the total sale of gas by statutory gas undertakings of the United Kingdom meant £828,843 to be found by the gas consumers. "Why the consumers?" asks the person skulking behind the screen. And he supplements this by the further interrogation: "Why cannot some of it come out of the colossal dividends and reserves of the gas industry? Why should the industry not bear a share of the burden of the war?"

The Answer.

We think if our anonymous interrogator had read the recent reports of the proceedings at the meetings of gas companies, he would not have put his absurd inquiry. However, about those "colossal" dividends. If he will trouble to look down our share list as published prior to the war, he will see that an investor, under the regulation of Parliament, thought himself lucky if he had a "colossal" dividend of about 5 per cent. on his investment; and, at the present time, owing to the increase in the price of gas and the operation of the sliding-scale, he has to content himself with £4 4s. and £4 8s. per cent. in the case of two of the large London Companies, subject to an income-tax which is of an order that causes very material shrinkage. As to the "colossal" reserves, these are strictly limited by Act of Parliament. They come out of the profits made by the companies, which profits are derived from the pockets of the consumers. These "colossal" reserves are as much a protection to the consumers as to anyone else. But when coal and ship owners cause large parts of reserves to vanish, they have to be built up again from profits, the source of which is the gas consumers. "Why should the industry not bear a share of the burden of the war?" Why should we waste space re-telling to a man the long story of what the gas industry is doing in connection with the war, and of the heavy burden being borne without complaint, when that man might have been in possession of the facts by reading beyond the particular lines in which he, for personal motives, is closely interested.

Coal Exports Reduction.

The Coal Exports Regulation Committee have during July been fully exercising their powers; for the reduction in the month compared with the corresponding period of last year was 3,185,921 tons—the highest showing of any month this year. With this return, we have the total reduction for the twelve war months. It amounts to 29,566,410 tons; while the Coal-Mining Organization Committee of the Home Office estimated that the savings to be effected on the exports would total to 24 million tons a year. At the time the report was issued, we expressed the opinion that the Committee had rather underestimated the savings. The actual quantity is in excess of their calculation by upwards of 5½ million tons. Yet the Coal Exports Committee have only been at work less than three months, and, of course, it took a little time to settle down to the work. The saving effected goes a long way towards compensating the shortage of output compared with previous years owing to miners having joined the Forces; and thus supplies for home use should be, with the miners putting their backs into the work with greater vigour and continuity, ample under present conditions.

Denaturing Spirit or Alcohol.

Some months ago, an announcement was made by the Board of Trade of which no doubt due note was at the time taken by inventors, who will be interested to study the fuller particulars now available regarding the matter referred to. The statement made was that international competitions had been organized by the Russian Ministry of Finance in respect (1) of methods of utilizing spirit or alcohol or their products, and (2) of new substances for denaturing spirit or alcohol. The particulars since received of the conditions governing the competitions should serve to stimulate investigation in a direction which is of great industrial importance. As regards the first competition, and glancing at the aspect of the offer with which readers of the "Journal" are more closely connected, it may be mentioned that prizes ranging from 75,000 to 5000 roubles will be awarded for the invention or perfection of apparatus for the utilization of spirit as motive power, fuel, or illuminant. In other branches, prizes of 60,000, 30,000, and 10,000 roubles respectively will be awarded for the invention of a novel means of adapting alcohol for the preparation of such a product as shall, by its nature, absolutely differ from the spirit from which it is made. Three prizes of 50,000, 20,000, and 5000 roubles are offered for the invention of a novel method of utilizing spirit for the preparation of a product, of which spirit or its products will appear as one of its component parts or dissolvent—providing that spirit cannot be extracted profitably from the product. Then three prizes of 30,000, 15,000, and 5000 roubles will be awarded for the invention of a novel method of utilizing spirit in productions where spirit or its products would serve as temporary intermediary dissolvents of either of the extracted or precipitated materials. As for the second competition, which has for its object to extend the use of spirit for technical purposes, three prizes of 30,000, 15,000, and 5000 roubles are offered for novel denaturing materials, for improving the existing methods. Inventors may reserve the right of benefiting from their ideas, and of protecting themselves with patents; and they should, without delay, secure copies of the full conditions from the Commercial Intelligence Branch of the Board of Trade, No. 73, Basinghall Street, E.C.

International Gas Congress Papers.

The programme of papers, so far as at present arranged, for the forthcoming International Gas Congress in connection with the Panama-Pacific Exhibition, and as published in the "American Gas Institute News," shows that there will be submitted contributions from this side prepared by the late Mr. Edward Allen, Mr. Charles Carpenter, D.Sc., Mr. John Bond, Dr. W. B. Davidson, Mr. J. Ferguson Bell, Mr. Walter Hole, and Mr. F. W. Goodenough. In no case, however, is it possible for a paper to be presented personally to the congress by the author. A symposium on "Illumination" will consist of six papers arranged by Mr. C. O. Bond, of Philadelphia; and the National Commercial Gas Association will also present papers dealing with the "business side." Other communications will include the "Development of Water Gas," by Mr. O. B. Evans, of Philadelphia; "Deep Fuel Combustion as Applied in Water-Gas Manufacture," by Mr. A. G. Glasgow, of London; "Modern Coal-Gas Processes," by the Society of Gas Engineering of New York; and the "Substitution of the Heating Value for the Illuminating Value in Gas Testing," by Dr. E. B. Rosa, of the Bureau of Standards.

PERSONAL.

Mr. A. S. Campbell has been appointed Secretary of the Wellingborough Gaslight Company—succeeding the late Mr. S. H. Kimbell, who held the position for forty-two years.

Mr. E. Bertram Williams, of Messrs. John E. Williams and Co., Manchester, has received a Commission as Sub-Lieutenant Engineer in the Royal Navy until the end of the war.

We regret to learn from Mrs. Bidwell that her husband Lieut. G. D. Bidwell (who, it was mentioned in the "Journal" some time since, had joined His Majesty's Forces) was wounded on the 7th inst. at the Dardanelles, and is now at the Deaconess Hospital, Alexandria.

The appointment of Assistant Inspector to the Trench Warfare Department, at the Ministry of Munitions, has been conferred on Mr. B. F. Botwood, draughtsman to the Gas Distribution Department of the Birmingham Corporation. Before taking up service in the gas undertaking, Mr. Botwood was engaged with Messrs. Kynochs.

Dr. W. B. Davidson, whose appointment as Chemical Engineer to British Dyes, Limited, was recorded last week, will, it has been decided by the Works Sub-Committee (subject to the approval of the Gas Committee and the Council) be succeeded as Engineer of the Nechells works of the Birmingham Corporation Gas Department by Mr. E. B. Tomlinson, the Works Engineer at Windsor Street. Mr. G. C. Pearson, the Superintendent at the Coal-Test Works, has been appointed to fill the position vacated by Mr. Tomlinson. It is understood the position of Superintendent of the Coal-Test Works will not be filled until after the war.

On leaving Birmingham to take up his new post as Works Superintendent at the Birkenhead Gas-Works, Mr. H. E. Stone was presented by the staff and workmen at Nechells with a gold watch, suitably inscribed, and a case of cutlery. The presentation was made by Dr. Davidson, who, with Mr. T. Brooke (the Works Superintendent) and others, spoke of the good work Mr. Stone had done, and wished him every success in his new sphere. Mr. W. J. Savage, on leaving to take up the post of Chemist to the Rochester, Chatham, and Gillingham Gas Company, has also received substantial evidence of the goodwill of the chemical staff at Birmingham, of which he has for some time past been a member.

It was stated in last week's issue that Mr. W. D. Child had retired from the position, which he has held for nearly forty years, of Engineer and Manager to the Romford Gas Company. In the report of the Directors for the past half year which has since been sent out to the shareholders, they announce with regret the death, in April last, of their late Chairman, Mr. Joseph Smith, J.P., who, for a period of nearly half-a-century, presided with devotion and success over the Company's affairs. Mr. W. G. Wilshaw, who for upwards of 25 years has been a member of the Board, has been installed as Chairman. To fill the vacancy on the Board, the Directors have nominated to the directorate Mr. Child; and this nomination the shareholders will at the forthcoming meeting be asked to confirm. As this involves Mr. Child's retirement from the position he has for so many years held, the Directors will ask the shareholders to grant him a retiring allowance, and thus mark their sense of the value of his prolonged services.

ELECTRICITY SUPPLY MEMORANDA.

Dissatisfaction, and Inveterate Deficits.

Electricity undertakings, like gas undertakings, are not just now enjoying cloudless skies. There are several more municipal concerns than customary that have ended the financial year with deficits, or a shrinkage of the surplus; and this with coal under the contracts made before the war. In the current year, there will be a still more serious showing for some of them, in view of the higher prices of fuel under the new contracts, and the cost of materials and labour generally. Where deficits or shrinkages of the surpluses are due to war conditions, there is no possible use complaining. But where deficits have become chronic, or where financial stability has been affected through the neglect of proper provision of reserves and for depreciation, the present conditions bring such circumstances into relief; and dissatisfaction is being heard from various places. When the annual accounts of the Electricity Department were presented to the Corporation of Bristol—accounts which on their face show quite a respectable condition, as municipal electrical accounts often do, until one begins to look critically into the constituent parts—Mr. Witty described the concern as a colossal failure, owing to inadequate provision in respect of depreciation. This gentleman has given notice of a motion for the rescision of the resolution for the adoption of the accounts; but what good this will do is not clear. At Manchester, too, Mr. Councillor Clyne has tabled a motion, asking for an inquiry, by an independent expert, into the working of the electrical undertaking; one purpose being to inquire whether the great scheme for the construction of electricity works at Barton should not be deferred until after the period of national financial stress. The Kingston-on-Thames people are getting very weary over their electricity concern; and with all the wrestlings of Mr. J. E. Edgcome, the Electrical Engineer, to improve things, the undertaking is loth to depart from its nearly life-long habit of producing a deficit. Last year it made a loss of £1295; the year before, £720; and during its entire career, it has managed to saddle the ratepayers with a net loss of £18,119. There is a quite laughable aspect of the so-called deficit of £1295 for last year. It is really much more than this; and it would have been better to have openly acknowledged it than try to hide the fact by throwing dust into the eyes of the ratepayers. In connection with the public lighting restrictions, gas companies are allowing local authorities for unconsumed gas; but though Kingston-on-Thames used 71,000 units of electricity less for street lighting, the money taken from the ratepayers for the purpose was £33 more than in the preceding year. The delightfully explicit explanation to the Council by Mr. Alderman Lyne, when challenged on this point, was that the Committee had not saved so much as was fancied, seeing that they had "simply saved the cost of generation, because the machinery had to be kept running just the same." Much the same thing is said by Chairmen of Committees whenever low prices to some consumers are attacked; and, if these statements were all pieced together, it would be found that there was precious little left on which to hang all the other expenses associated with the capital, establishment, and other working charges, besides those of generation. We suppose chairmen of electricity committees are not aware that the public lighting does help to push-up the peak of the load, and does cause a fair amount of expenditure when most good folks have gone to bed, and prefer to be without lights than with them. There are some aldermen and councillors who are awfully good natured, and will swallow anything. What they say on such matters probably serves for the layman; but people who know better—well, they smile indulgently when affairs are in a tight corner. The electricity tariff at Kingston has been—notwithstanding the charge for street illumination of which the public have been deprived—raised practically all through, in order to improve things in the current year; but it is not anticipated that the additional revenue will be co-terminous with the shortage. The question has been again raised as to the sale of the undertaking; but Alderman Lyne solemnly asked who is likely to be prepared to buy it at this time, or to form a company for the purpose of running it? Echo answers, Who?

Diesel Costs

There was one point regarding generating costs that was made much of at the Kingston-on-Thames meeting—obviously for the purpose of putting a feather in the cap of the Electrical Engineer and of the Electricity Committee. For the admiration of a Council without technical knowledge of these things, it was stated that the cost of fuel last year with the steam plant had been 1·802d. per unit, and with the Diesel engines—one of 400 and the other of 600 B.H.P.—0·424d. For fuel only! It is not fair to take fuel only. The comparison should be from the capital to the final charge for generating, when plants of such distinctive characteristics are being compared, because what one form of plant may gain on the fuel may be lost in some other way. The past year, too, has not been a normal one for comparison purposes, nor will the coming one be so, with coal dearer, and with the prospect, as Sir Corbet Woodall was pointing out the other day [*ante*, p. 280], of oil becoming scarce in this country owing to the shortage of tank-steamers. The oil-fuel cost quoted at Kingston is with oil at the old contract prices; for it was only on June 15 [p. 632] that we were mentioning the heavier price the Kingston Corporation are paying for oil for the Diesel plant under the new contracts recently entered into. It was also then remarked that there were differences in other costs than fuel which should be taken into consideration, in order to arrive at comparable costs per unit. Quite lately the Diesel Engine Users' Association were meeting at Kingston, and were considering the question of the allowance for depreciation of Diesel plant in connection with income-tax assessment; and a resolution was then passed expressing the opinion that the allowance made by the Inland Revenue Authorities—5 per cent. on the diminishing capital value—was inadequate, and that at least 15 per cent. per annum should be claimed. This expression of opinion speaks volumes to an engineer.

And Diesel Troubles.

The Diesel Engine Users' Association have not only been considering the depreciation allowance for income-tax assessment, but they have been collecting data as to lubrication, over-all costs, and practices in connection with the working of the plant. But a protecting veil of secrecy has been thrown over the data; and they are only to be circulated among the members. This is not such a good advertisement for the Diesel engine as openness should be, if all is well. If the engine has nothing of which to be ashamed, then why hide these matters? Another thing that does not look well, apart from the high depreciation allowance claim mentioned in the previous paragraph, is the high premium asked by insurance companies for insurance against any breakdowns of Diesel engines—so high are the rates that a considerable number of plants have not so far been insured. This is a matter with which not long since Mr. W. A. Tookey was dealing before the Junior Institution of Engineers. Broken crankshafts, seized pistons, and other serious accidents have been mentioned in the Technical Press. These mishaps Mr. Tookey is inclined to attribute to the over-stressing of cranks and excessive heating of pistons due to the tendency to overrate the permissible output of power from given cylinder dimensions. There was a case of a serious breakdown of a Diesel engine at Oxford in September last. It was a 650 B.H.P. engine, running at 240 revolutions per minute; but as it failed to give the guaranteed fuel consumption, it was reduced to 520 B.H.P., at 214 revolutions per minute. The breakdown occurred suddenly without any intimation of anything being wrong. It was a terrible smash; and the expert called in came to the conclusion that the failure was due to one of the bolts in the big end of the connecting-rod being of insufficient strength for the purpose. Another thing that has to be provided against is local overheating. Mr. G. E. Windeler states that in a well-designed Diesel engine, 40 per cent. of the heat units admitted to the combustion space is absorbed in useful work; of the remainder, 25 per cent. passes to the exhaust, and 35 per cent. to the circulating water, and is lost in radiation, &c. Consequently, very special means have to be adopted, in order to remove a considerable amount of heat. Any defect in the water circulation is liable to cause local overheating. Investigations have shown that most defects that have arisen in the cylinder covers and pistons of Diesel engines were due to serious deposits of salts in the water spaces, and that such deposits were not formed during times of working. The explanation is that the flow of water is generally stopped when the engine is stopped; and the heat remaining in the walls of the cylinder is sufficient to cause a deposition of salts to take place. In view of this the flow of water is continued for a time after an engine has ceased running. Mr. Windeler says that he has personally inspected one cylinder cover which contained a water space about 6 inches deep, and found a deposit of as much as 5 inches thick in the water space. On the question of seizures of pistons, these, according to the same authority, are almost invariably due to the heating of the piston pin and its bearing; and the seizures occur almost immediately after starting-up. Running the circulating water through the engine after shutting down tends to minimize the difficulty. The use of a hand lubricating pump by means of which lubricating oil under pressure can be pumped to all the bearings, including the piston pin bearing, while the engine is being barred round into its starting position, also to a large extent removes the difficulty.

The Secession.

The small band of "Point-Fives" has lost one of its members—Mr. H. F. Street, of Southampton—or rather he has become disqualified, for the 0·5d. per unit has no further place in his tariffs. This is no doubt an outcome of the report of Sir John Snell, in which, while he said that probably no harm had been done to the Corporation electricity undertaking by charging 0·5d. per unit for cooking and heating, he could not justify this charge standing alone. The Corporation have not, however, followed Sir John in his suggestion as to the adoption of the rateable value system, but have preferred to increase the flat-rates. The alterations made are as follows: For private lighting the charge for the first 50 units is to be 3½d. per unit, instead of 3d.; the charge for consumption above this amount remaining at 2½d. For business premises, the charge is to be increased from 3d. to 3½d. per unit; for supply outside the borough, 3½d. instead of 3d.; and for heating and cooking, whether inside or outside the borough, ¾d. per unit, instead of ½d. A simpler scale than at present in use for power purposes is to be drawn up. No alteration is to be made in public lighting or traction. We take it that Mr. Street's secession from the Point-Fives is not a voluntary, but a compulsory, act. However, voluntarily or compulsorily, the Association loses a member; and during the inevitable requiem at the next meeting, the sorrowing members may depend upon our sympathy.

Intrinsic Brilliancy and Luminous Efficiency.

The illuminating engineer professes obedience to the prescriptions of the physicist and the ophthalmist, when the prescriptions are of real scientific birth—the profession is made in print and in the lecture theatre of the Royal Society of Arts. Outside, some members of this group who happen to have electricity for sale claim by silent act that commercial expediency must have ascendancy over scientific principles, and so (when we are not at war with Germany) they fix, little more than man high, on the fronts of tobacco shops, the establishments of vendors of cheap jewellery, and other places where ordinary trading takes place, unshielded lamps of considerable intrinsic brilliancy; and rather than lose customers, they do the same in school rooms and in the home. They say it is not their fault that they have not the ideal light from the physiological point of view; and if people are so stupid as to go and damage their eyesight by the use of lamps of high brilliancy, without providing protection, they have only themselves to blame. These illuminating engineers are like the preacher who talks of ethical principles, and outside violates the whole chain of them. Dr. Herbert E. Ives has been dealing, before the American Electro-Chemical Society, with the subject of the ideal light; and it is clear from what he says, and from the fact that the "Electrical Review" puts a paragraph referring to the paper on the last page of its matter in a recent issue, that the "ideal light" is not one with the intrinsic brilliancy of the metallic filament electric lamp. Dr. Ives says the vacuum type of tungsten lamp is three hundred times as bright as the brightest object by day—viz., a white surface in the sun. The nitrogen filled tungsten lamp is a thousand times as bright. He urges the importance therefore of employing reflecting and diffusing media, in order to defend the vision. In his expert judgment a surface source of an intrinsic brilliancy of not more than 0·001 candle power per sq. cm. is required; and he believes a low intrinsic brilliancy is in great demand. From this, he turns to the subject of the efficiencies of modern illuminants, which he says are surprisingly low. Figuring from coal, 1 per cent. is the best figure obtainable to-day—light being only a small bye-product. Measurements made by Dr. Ives of the total luminous efficiency based on 50-candle power as the mechanical equivalent of light supply the following data:

	Luminous Efficiency of the Radiation. Per Cent.		Total Luminous Efficiency. Per Cent.
Four-watt carbon lamp	0·45	..	0·42
Vacuum tungsten lamp at 1·25 watts per candle	1·65	..	1·3
Nitrogen-filled lamp at 0·70 watt per candle	2·93	..	2·4
Welsbach mantle, 0·75 p. c. ceria .	1·2	..	0·19
Open-flame gas-burner	0·19	..	0·036
Yellow flame arc	..	..	7·2

Please observe that Dr. Ives does not in this table use the expression "half-watt" lamp. He calls the example of that misnamed class a "nitrogen-filled lamp at 0·7 watt per candle."

Fire and Electricity Supplies.

The advocates of electricity plant concentration are constantly coming up against experiences which say "Don't." We have noted a few of them from time to time in the "Memoranda." Station fires have been among them—fires which have caused a discontinuance of the service to the trustful ones in large supply areas. The last example is the destruction by fire, on the 1st of the month, of the electric power station of the Ebbw Vale Steel, Iron, and Coal Company—the whole of the excellent plant being involved in the destruction, as well as the buildings. It is estimated that the number of men thrown idle is about 10,000. The District Council of Ebbw Vale purchase electricity in bulk from the Company; and so the domestic and public supplies (as well as that to the extensive works) were affected. For public lighting there are in use about 1100 50-candle power lamps. The station is a fair sized one, but, of course, it is a pigmy to the large concentrations of plant proposed for London. However, it illustrates a point of danger.

Electric Lamps and Fire-Raising.

A short time ago, mention was made in the "Memoranda" of a report issued by the London Fire Brigade regarding a fire that had been caused by the idiotic practice of complying with the police regulations as to shading shop lights by committing the premises to the danger of serving as a burning example of how not to do it. The Fire Brigade protested against the use of coloured paper shades in close contact with electric bulbs—they having been called to a shop that was alight from this cause. Mr. F. W. Willcox, of the British Thomson-Houston Company, some time ago called attention to the danger; and he has taken the opportunity of once more emphasizing it by special reference to the Fire Brigade's warning. While the Fire Brigade only specifically direct attention to one example, this does not mean that they have only been called to a single fire due to the stupid practice. The act of asking public attention to the matter evidences the concern of the Brigade. It is generally known there have been many shop lamp shades inflamed, and so were potential sources of conflagration. "Installation Topics" in "Electrical Times" says that even painted bulbs are dangerous, owing to the radiant heat being absorbed by the pigment. The so-called "half-watt" or gas-filled lamps are really more dangerous than the other tungsten filament lamps, owing to the higher temperature at which they have to be worked, and the inert gas acting as a conductor of heat. We have seen some flexibles connected to these gas-filled lamps which have become quickly discoloured, and this indicates the perishing of the insulation. However, the London Fire Brigade's warning is looked upon by the electrical papers as a good point with which contractors can go and probe shopkeepers into having their window lighting altered, by placing the lamps behind top screens, or in diffusing bowls.

Excess Lime Method of Water Purification.—The recently issued eleventh report on research work by Dr. A. C. Houston, the Director of Water Examination to the Metropolitan Water Board, is devoted mainly to a report on experiments on a practical scale with the excess lime method of purification of water. In previous reports the amount of lime required, under laboratory conditions of experiment, have been fully considered; and now useful information is given as to actual results on Thames water. These practical experiments were carried out at Sunbury, and dealt with a hard water; this spot being chosen because there were available there tanks and other facilities for carrying out the investigation at a reasonable cost. The material used was 3400 lbs. per million gallons of water of slaked and ground lime (calcium hydrate), containing 58 per cent. of calcium oxide. As the result of the investigation, Dr. Houston says no hesitation is felt in expressing the opinion that river water, no matter how impure, may be brought into a condition of absolute safety bacteriologically, and of great relative purity chemically, by means of lime.

COMPARATIVE WORKING RESULTS OF THE LONDON AND FOUR SUBURBAN GAS COMPANIES.

IN THE HALF YEAR ENDED JUNE 30, 1915.

Compiled by Mr. F. J. BRADFIELD, the Secretary of the Commercial Gas Company.

—		Gaslight and Coke.	South Metropolitan.	Commercial.	Brentford.	Wandsworth.	South Suburban.	Tottenham.
Gas sold	thousands	13,453,753	6,626,723	1,752,101	1,917,669	1,266,215	1,109,686	1,179 830
Increase	per cent.	Dec. 4·31	Dec. 3·73	2·23	1·65*e*	Dec. 0·81	0·06	1·50
Gas made per ton of coal	cubic feet	13,014	12,180	14,019	12,103	13,426	13,010	12,811
,, ,, per gallon of oil	,,	411	..	454	438	449	457	386
Gas unaccounted for	per cent.	5·42	3·26	6·80	4·15	5·56	3·39	6·38
Coke made for sale per ton of coal	cwt.	9·88	9·02	10·96	10·51	11·35	10·24	9·14
Tar made per ton of coal	galls.	10·47	9·47	11·20	13·68	10·47	9·59	..
Liquor made per ton of coal	galls, 8 oz.	38·09	40·56	38·98	35·83	36·53	36·79	38·52
Percentage of coke used as fuel		20·06	26·64	12·28	15·09	9·17	21·54	24·70
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Capital expended per 1000 cubic feet sold during the past year		11 1·82	8 4·00	8 6·76	7 0·92*f*	7 7·41	9 10·69	8 9·24
Price charged per 1000 cubic feet		2/8 to 3/- 2/4 to 2/10	2/4 and 2/10	2/4 and 2/8	2/4 to 3/6	1/9 to 3/1	2/5 to 4/2 2/10 to 4/7	2/- and 2/8
Costs per 1000 Cubic Feet of Gas Sold.								
REVENUE ACCOUNTS.		d.	d.	d.	d.	d.	d.	d.
Coals, oil, &c.		15·73	21·45	15·54	16·29	16·20	19·84	16·62
Less residuals—Coke and breeze		5·11	7·66	4·46	4·29	5·56	7·74	4·58
Tar		1·27	1·82	1·20	1·26	1·26	1·41	1·29
Amm. liq. and sulph. amm.		1·46	2·23	1·46	1·03	1·23	1·70	0·86
Total residuals		7·84	11·71	7·12	6·58	8·05	10·85	6·73
Net for coals, oil, &c.		7·89	9·74	8·42	9·71	8·15	8·99	9·89
MANUFACTURE—								
Salaries		0·28	0·69	0·47	0·50	0·32	0·59	0·30
Wages—carbonizing		1·58	1·82	1·51	1·46	1·77	1·28	1·31
Purification		0·23	0·69	0·14	0·18	0·16	0·11	0·28
Repairs—plant		4·28	3·65	3·39	2·86	4·01	4·52	3·21
Net manufacture		14·26	16·59	13·93	14·71	14·41	15·49	14·99
DISTRIBUTION—								
Wages and salaries		1·10	0·79	0·82	1·04	1·32	1·47	0·90
Repairs—Mains and services, &c.		1·61	1·17	1·34	1·51	2·51	1·86	2·57
,, Meters and prep. meters and fittings		1·83	1·82	2·01	0·99	0·88	2·15	1·79
,, Stoves—ordinary and prepayment		1·75	1·00	1·52	1·59	1·43	1·82	1·24
Total net manufacture and distribution		20·55	21·37	19·62	19·84	20·55	22·79	21·49
Public lamps—lighting and repairing		0·46	0·52	0·35	0·40	0·48	0·68	0·37
Rents, rates, and taxes		3·13	2·06	2·42	1·96	1·15	1·86	2·02
MANAGEMENT—								
Directors, Auditors, and salaries (Secretary, &c.)		0·24	0·27	0·33	0·45	0·54	0·77	0·48
Collectors		0·50	0·64	0·73	0·50	0·46	0·54	0·46
Stationery and general charges		0·24	0·60	0·45	0·30	0·47	0·32	0·38
Profit-sharing		0·23	0·66	0·37	..	0·50	0·62	0·69
Bad debts		0·13	0·08	0·04	0·09	0·07	0·05	0·04
Law and parliamentary charges		0·01	0·05	0·01	0·11	0·00	0·03	0·03
Superannuations, &c.		0·49	0·44	0·34	0·49	0·39	0·56	0·36
National Insurance		0·07	0·07	0·07	0·06	0·08	0·07	0·07
Active service allowances and war bonus		0·13*b*	0·64	..*a*	0·83	0·94	0·56	0·69
Sundries		0·04	0·03	0·01	0·00	0·03	..	..
Total expenditure (*less* residuals)		26·22	27·43	24·74	25·03	25·63*h*	28·85	27·08
GAS		33·09	29·50	28·68	28·37	26·44	33·78	25·00
Rentals—Meters and prep. meters and fittings		2·88	3·34	2·92	3·95	2·76	2·24	1·96
Stove		1·38	1·38	1·75	1·13	2·30	1·67	3·91
Incand. mantle maintenance		..	..	0·11	..	0·14	..	0·12
Miscellaneous		0·11	0·06	0·00	0·01	0·06	0·08	0·04
Total—Gas, rentals, &c.		37·46	34·28	33·46	33·46	31·70	37·77	31·03
Balance, being profit		11·24	6·85	8·72	8·43	6·07	8·92	3·95
Dividend and interest		9·90	6·50	8·12	7·03	6·68	7·28	6·11
Surplus		1·34	0·35	0·60	1·40	Def. 0·61	1·64	Def. 2·16
Contributions to funds and sundry payments		0·42*c*	0·22*d*	..	2·64*g*	0·36*i*	0·59*j*	0·05*k*
SUNDRIES.		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton		19 4·35	20 9·57	19 4·91	..	18 11·69	..	19 0·38
Coke realized per ton of coal		6 11·06	7 1·41	7 3·12	6 10·52	7 10·11	9 11·28	6 6·46
Coke ,, ,, of coke		14 0·23	15 9·37	13 2·90	13 0·97	13 9·78	19 5·02	14 3·63
Breeze ,, per ton		5 10·49	5 8·65	4 0·92	4 11·65	1 10·84	..	1 9·88
Tar realized per gallon		0 2·21	0 2·24	0 1·82	0 1·59	0 1·90	0 2·28	0 1·60
Amm. liquor, &c., realized per butt (8 oz.)		6 3·61	5 8·99	6 9·90	5 1·37	5 3·92	6 5·43	3 6·35
Percentage of stoves at rental to consumers		81	98	70	79	90	96	67
Bad debts per cent. on total receipts.		0·28	0·18	0·10	0·23	0·18	0·11	0·10
Net profit per cent. on ordinary capital		5·12	4·70	5·28	6·85	4·84	6·23	3·09*l*
One penny variation equals in half year		£56,057	£27,611	£7300	£7990	£5276	£4624	£4916
Carb. water gas, per cent. on total make		33·32	..	36·72	42·17	29·10	19·62	32·66

a ·87 Included with Wages items. *b* On Active Service only. *c* Writing-down Consols and to Reserve Fund. *d* To Insurance Fund. *e* On Amalgamated Companies' figures. *f* On Half-Year's figures. *g* Compensation to Directors and Stamp Duty. *h* Capital Duty eliminated. *i* Capital Duty. *j* Special Purposes Fund. *k* Loss on Electricity Accounts. *l* Including Electricity Results.

New Lighting Order for London.—The Metropolitan and City Police have issued a new lighting order for London, which has now come into force. All the provisions of the previous orders as to reduced lighting are retained; and the hours affected are: From 8.30 p.m. till sunrise during August; from 7.30 p.m. till sunrise during September; from 6 p.m. till sunrise during October, and until further notice. The lighting-up hour for all vehicles is changed. Instead of the front and rear lamps being lighted, as hitherto, at one hour after sunset, lamps must, until further order, be lit half-an-hour after sunset; and all vehicles travelling in the public streets must continue to show their lights till half-an-hour before sunrise.

COMPARATIVE WORKING RESULTS OF THE LONDON AND FOUR SUBURBAN GAS COMPANIES.

TABLE SHOWING THE VARIATION, INCREASE OR DECREASE, ON FIGURES OF CORRESPONDING HALF YEAR, 1914.

[The figures in heavy type show the decreases.]

Compiled by Mr. F. J. BRADFIELD, the Secretary of the Commercial Gas Company.

	Gaslight and Coke.	South Metropolitan.	Commercial.	Brentford.	Wandsworth.	South Suburban.	Tottenham.
Gas sold . . . thousands	**605,701**	**257,105**	38,250	124,322*	**10,392**	657	17,453
Increase (variation equal to) . . . per cent.	**6·19**	**6·02**	·55	**5·77**	**8·73**	**7·24**	**4·19**
Gas made per ton of coal . . . cubic feet	677	**296**	264	64	545	41	**337**
,, ,, per gallon of oil . . . ,,	**31**	..	7	**5**	**38**	44	**71**
,, unaccounted for . . . per cent.	**2·10**	·74	**·14**	·04	**1·82**	·11	1·04
Coke made for sale per ton of coal . cwt.	·06	·39	**·07**	·30	·96	**·25**	**·25**
Tar made per ton of coal . . . galls.	·04	**·10**	·30	3·41	·31	·17	..
Liquor made per ton of coal . . . galls, 8 oz.	1·15	**·60**	·03	**·60**	**·12**	**·57**	1·02
Percentage of coke used as fuel . . .	**·61**	**3·41**	·55	**3·22**	**7·67**	2·22	·35
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Capital expended per 1000 cubic feet sold during the past year . . .	0 5·27	0 6·03	0 1·45	0 0·05	0 5·12	0 2·65	0 1·44
Price charged per 1000 cubic feet† . . .	0 6·00	0 8·00	0 4·00	..	0 4·00	0 7·00	..
Costs per 1000 Cubic Feet of Gas Sold.							
REVENUE ACCOUNTS.	d.	d.	d.	d.	d.	d.	d.
Coals, oil, &c. . . .	·02	6·24	·21	1·40	**1·16**	1·72	·56
Less residuals—Coke and breeze . . .	**·60**	2·12	·18	**·01**	**·48**	1·92	**·40**
Tar . . .	**·46**	**·06**	**·20**	**·06**	**·59**	**·35**	·01
Amm. liq. and sulph. amm .	**·49**	**·11**	**·19**	·17	**·42**	·06	**·50**
Total residuals . . .	**1·55**	1·95	**·21**	·10	**1·49**	1·63	**·89**
Net for coals, oil, &c.	1·57	4·29	·42	1·30	·33	·09	1·45
MANUFACTURE—							
Salaries . . .	·01	·02	·04	·06	·08	**·03**	·03
Wages—carbonizing . . .	**·08**	·08	·08	·03	·11	·04	**·36**
Purification . . .	**·02**	·03	**·08**	**·06**	**·11**	·02	**·01**
Repairs—plant . . .	·08	**·70**	**·11**	**1·07**	**·15**	2·14	·21
Net manufacture . .	1·56	3·72	·35	·26	·26	2·26	1·32
DISTRIBUTION—							
Wages and salaries . . .	·05	·01	**·02**	**·07**	·07	·07	**·14**
Repairs—Mains and services, &c. . . .	**·09**	**·35**	**·08**	**·80**	·37	**·71**	**·52**
,, Meters and prep. meters and fittings	·08	**·75**	**·07**	**·05**	**·23**	**·74**	**·16**
,, Stoves—ordinary and prepayment .	·07	**·56**	**·18**	**·16**	**·29**	·56	**·05**
Total net manufacture and distribution .	1·67	2·07	0·00	**·82**	·18	1·44	·45
Public lamps—lighting and repairing . . .	·01	**·06**	**·09**	**·04**	**·05**	**·21**	**·02**
Rents, rates, and taxes . . .	·14	·18	·00	·12	·11	**·06**	·02
MANAGEMENT—							
Directors, Auditors, and salaries (Secretary, &c.)	·01	·00	·01	·03	**·04**	·05	**·02**
Collectors . . .	·04	·05	·03	·00	·02	·04	·00
Stationery and general charges . . .	**·01**	**·02**	**·01**	**·01**	**·08**	**·06**	**·14**
Profit-sharing . . .	**·16**	**·36**	**·14**	..	**·03**	**·15**	**·01**
Bad debts . . .	·05	·02	**·01**	·02	·03	·02	·01
Law and parliamentary charges . . .	**·05**	·03	**·05**	**·21**	**·01**	**·09**	·00
Superannuations, &c. . . .	·02	·16	·01	·01	**·01**	**·07**	·00
National Insurance . . .	**·01**	**·05**	**·01**	**·01**	**·01**	**·01**	·00
Active Service Allowances and War Bonus . .	·13	·64	..	·83	·94	·56	·69
Sundries . . .	·00	·00	**·01**	·00	**·01**	..	·00
Total expenditure (*less* residuals) . . .	1·84	2·66	**·27**	**·08**	1·04	1·46	·98
GAS . . .	3·66	3·41	1·25	·24	1·27	3·49	**·17**
Rentals—Meters and prep. meters and fittings	·07	·01	·10	·49	**·01**	**·13**	·02
Stove . . .	·14	·05	·05	·11	·17	·06	**·10**
Incand. mantle maintenance . . .	..	..	·00	..	**·32**	..	**·04**
Miscellaneous . . .	·01	·01	**·01**	·00	**·03**	**·02**	**·13**
Total—Gas, rentals, &c. . . .	3·88	3·48	1·39	·84	1·08	3·40	·32
Balance, being profit . . .	2·04	·82	1·66	·92	·04	1·94	**1·30**
Dividend and interest . . .	**·47**	**·85**	**·89**	·22	·22	**1·03**	01
Surplus . . .	2·51	1·67	2·55	·70	**·18**	2·97	**1·31**
Contributions to funds and sundry payments .	·16	·22	..	2·64	·00	·59	**1·95**
SUNDRIES.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton . . .	2 6·65	5 6·89	1 9·04	..	1 3·29	..	0 1·59
Coke realized per ton of coal . . .	0 3·49	1 10·50	1 0·15	0 0·53	1 3·79	3 4·63	**0 1·54**
Coke ,, ,, of coke . . .	0 6·25	3 7·64	1 11·00	**0 3·57**	1 3·09	6 11·03	0 1·31
		Per Yard.				Per Yard.	Per Chal.
Breeze ,, per ton . . .	1 7·30	..	0 9·65	1 9·73	0 6·76	..	..
Tar realized per gallon . . .	**0 0·28**	**0 0·12**	**0 0·22**	**0 0·37**	**0 0·43**	**0 0·30**	**0 0·56**
Amm. liquor, &c., realized per butt, 8 oz. . .	**0 9·99**	**0 4·72**	**0 1·42**	1 0·42	**0 0·40**	1 0·01	**1 10·28**
Percentage of stoves at rental to consumers . .	4	**2**	3	..	..	5	6
Bad debts per cent. on total receipts . . .	·09	·03	**·03**	·05	·08	·04	·03
Net profit per cent. on ordinary capital . . .	1·09	·41	1·20	..	**·94**	1·40	**1·60**
One penny variation equals in half year . . .	**£2524**	**£1071**	£159	£518	**£43**	£3	£73
Carb. water gas per cent. on total make . . .	8·60	..	5·73	1·04	18·14	9·40	6·70

* This figure represents the variation on the absorbing Company's own figures, and not on those of the amalgamating Companies, whereas on the preceding table the increase on the "Gas Sold" is on the amalgamated figures.

† These figures show the increases in price in the Companies' principal areas.

Gas Consumption in Germany.—The statistics collected by the Central Gas Publicity Organization of Berlin show that the gas made by 831 German works last May was 2·4 per cent. less than the quantity made by the same works in May, 1914. For similar figures for earlier months since the outbreak of the war, see the "JOURNAL" for the 27th ult., p. 186.

ILLUMINATING ENGINEERING SOCIETY OF AMERICA.

A preliminary programme has now been issued for the ninth annual convention of the Society—to be held in Washington, from the 20th to the 22nd prox. The last issue of the "Transactions" of the Society points out that the papers, which promise to be of an unusually high standard, are to be distributed over ten sessions. One of the sessions will be devoted especially to the subject of street lighting; while commercial, general, and laboratory papers will each be given three sessions. Inspection trips, a reception, and a banquet are among the entertainment features.

After the formal opening of the proceedings and an address of welcome to Washington, the President's address and reports of Committees on Lighting Legislation, Nomenclature and Standards, and Progress will occupy the morning sitting of the first day. The subsequent proceedings will include the following papers to be read in the four sections above referred to:—

General Session.

Tests and Experiments in Connection with the New Commonwealth Edison Company Building—Ship Lighting—Illumination Efficiency as Obtained in an Experimental Room—Photometry with Portable Instruments—New Test Plate for Illumination Photometers—Incandescent Lamp Testing and Photometry—Street Lighting—Artificial Illumination in Practical Photography—Photographic and Visual Illumination Efficiencies—Production and Application of Ultra-Violet Light—A Flux Method of Obtaining Average Illumination.

Street Lighting Session.

Gas Street Lighting—Arc Lamps for Street Illumination—New Types of Incandescent Lamps and their Relation to the Street Lighting Problems—Ornamental Street Lighting.

Commercial Session.

How to Attack a Lighting Problem—How can a Combination Gas and Electric Company Render the Best Services to Customers?—Small Incandescent Lamps and Special Illumination Problems—Lighting of Office Buildings—Flame Pilot Ignition of Incandescent Gas-Lamps—Practical Illumination as Exemplified by Some Recent Installations of Incandescent Gas-Lamps—Mercury Arc Lamps for Industrial Lighting—Relation between Proper Illumination and Accident Prevention—Artificial Illumination of Interiors—Lighting of State, War, and Navy Buildings—Lighting of Gymnasiums and Armories with Incandescent Lamps.

Laboratory Session.

Crova's Method of Coloured Light Photometry Applied to Modern Incandescent Illuminants—Differences in Threshold and Acuity Variations—Visual Efficiency—Yellow Screens—Retinal Sensibilities in Relation to Illuminating Engineering—Effect of Distribution of Light on Muscular Control—Effect of Various Wave-Lengths of Radiation on Eye Cataract—Effect of Surrounding Gas on an Incandescent Filament—Parabolic Mirror.

◆

A STUDY OF BOILER LOSSES.

This was the subject of a "Bulletin" recently issued by the University of Illinois. The tests were undertaken to permit of a detailed study of the boiler and furnace losses of the new power plant installed at the University, under varying loads, depth of fuel bed, &c.

The fuel used throughout was coal, in most cases freshly mined, but in some cases weathered coal was employed. The boiler on which the tests were run is one of a battery of two Babcock and Wilcox boilers. The boiler drum is 42 inches by 20·3 feet, and contains eighteen sections of 4-inch tubes, 18 feet long; each section with fourteen tubes. The distance from the floor to the first row of tubes is 8 ft. 6 in. at the front end. The style of baffling adopted differs from the standard, inasmuch as the construction provides a tile roof over the furnace and makes the attainment of a long combustion chamber possible. The first pass for the gases is thus at the rear of the setting, and they are discharged into a breeching at the front instead of at the back of the boiler, as in the standard type. The effective length of grate is 9 ft. 6 in., and the area of grate surface 90 square feet.

The analysis of the fresh coal, as fired, was as follows:—

Fixed carbon, per cent.	30·2	to	45·4	proximate
Volatile matter, ,,	29·1	,,	40·7	
Moisture, ,,	12·4	,,	22·0	
Ash, ,,	10·4	,,	20·2	
Sulphur (determined separately)	1·3	,,	4·3	
Carbon, per cent.	58·9	,,	69·0	ultimate
Hydrogen, ,,	3·5	,,	5·3	
Oxygen, ,,	4·5	,,	13·4	
Nitrogen, ,,	1·1	,,	2·5	
Sulphur, ,,	1·6	,,	5·2	
Ash, ,,	12·6	,,	23·8	

From a study of the numerous tables and curves with which the text is illustrated it is concluded that the over-all efficiency of the unit tested, under the average conditions which prevailed during the tests, and when developing in the neighbourhood of 550 boiler horse power, is about 64 per cent.

For the coal used, Mission Field screenings, the best thickness of fire was found to be 7 or 7½ inches, depending on the amount of fine material in the coal. The maximum capacity developed was 768 boiler horse-power. This was obtained from pea coal with a 7-inch fuel bed and a draught over the fire of 0·375 inch of water.

The best rate of carbonization approximates 26 lbs. of dry coal per square foot of grate surface per hour. The draughts over the fire required to give this rate are as follows: 0·18 inch water for a 6 inch fire, 0·22 inch for a 7-inch fire, 0·29 inch for an 8-inch fire, and 0·52 inch for a 9½-inch fire. The greatest losses were due to combustible in the ash, excess air, and air leakage. The smallest loss was that due to the formation of carbon monoxide.

With the exception of the air leakage loss, which can be practically eliminated without affecting any of the others, the rest of the losses are to some extent interrelated; and there are certain well-defined limits within which the excess air must be maintained in order to reduce the others to a minimum. This is approximately 30 to 40 per cent.

The sum of the excess air loss, and the loss due to combustible in the ash, was nearly constant. It amounted to about 14 per cent., and a decrease in one source of loss could be accomplished only by an increase in the other. Hence the formation of carbon monoxide was the factor having the greatest bearing on the extent to which excess air could be reduced. The latter could be decreased until carbon monoxide appeared in excess.

The percentage of carbon dioxide depends to some extent on the attention required by the fire. It was low in the tests during which the side door had to be frequently opened in order to allow barring and raking of the fire. The form of baffling adopted makes the maintenance of high furnace temperatures possible, and reduces the amount of smoke formed.

◆

DETERMINATION OF THE CALORIFIC VALUE OF GAS.

In a recent number of "Gas und Wasser," Herrn H. Strache and E. Glaser describe a simple and accurate method of determining the calorific value of small quantities of gas by means of the Junkers calorimeter. The formula is only applicable to coal gas and mixtures of coal gas and carburetted water gas, where the room temperature is 3° or 4° C. higher than the inlet water to the calorimeter, with a gas rate from 3·4 to 4·4 cubic feet (96 to 126 litres) per hour, and provided also that the CO_2 produced by the combustion of 1 cubic foot of such gas does not exceed 0·48 cubic foot.

The gas is supplied to the calorimeter from a large measuring bottle—being displaced by the water flowing from the calorimeter. This latter water enters first a Woulff's bottle to allow of the escape of any air carried with it.

The formula is as follows:

$$\text{Gross value} = \frac{t_D}{p} 1{\cdot}01 + 64 - H.$$

$$\text{Net value} = \frac{1{\cdot}01}{p}\left(t_D - \frac{597d}{V_D}\right) - 10.$$

where

t_D is the rise in temperature of the water flowing through the calorimeter.

p is the tabular number for temperature and pressure.

H the hygrometer reading.

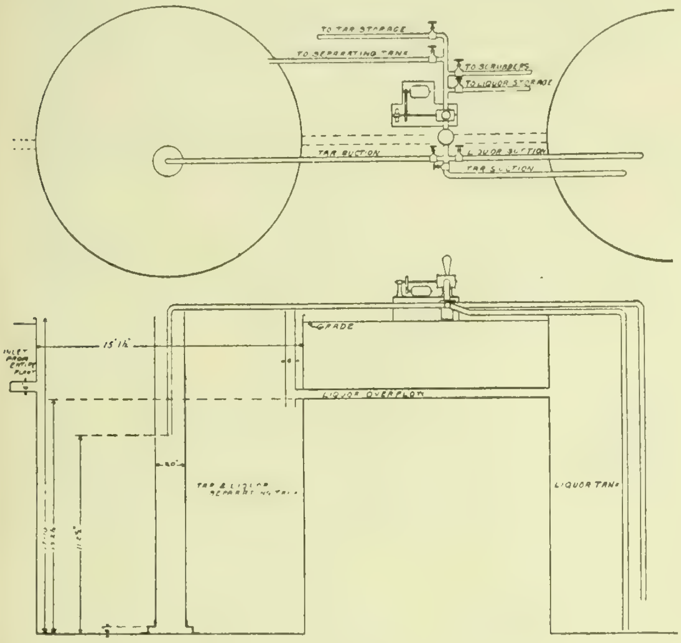
d is the quantity of condensed water from the combustion of V_D litres of gas.

New Nitrogen Factory in Norway.—At the Bjölva waterfall, Norway, a new factory is, says "Engineering," to be erected for the manufacture of sulphate of ammonia and cyanamide. Arrangements have already been made to dispose of the output of the latter product for a period of five years. The annual output of sulphate of ammonia will be about 6000 tons. The matter is being supervised by a Committee of four experts, who are at present in Sweden to study the new method of manufacture.

Possibilities of Ammonia Production in Australia.—Pointing out the advisability of the Victorian Government encouraging the production of ammonia from the huge deposits of brown coal in that part of the world, a writer in the "Australian Mining Standard" says: "The vast stores contained in the almost inexhaustible deposits of brown coal have been hitherto entirely neglected. Brown coal is fairly rich in ammonia. It is computed that every ton of this coal contains approximately 3s. 8d. worth of ammonia; and when it is considered that the cost of getting the coal in some parts of Victoria does not exceed 1s. 6d. per ton, the profit upon the work is evident. No emphasis is here laid upon the other possibilities—viz., coal gas, tar, pitch, and creosote, nor upon the 50 or 60 per cent. of residual carbon. For the production of ammonia alone the Government and people of Victoria should, without delay, address themselves to the destructive distillation of brown coal—the State Government particularly, as being the administrators, under the Crown, of those estates which are known to contain this remarkable wealth."

TAR PUMPING.

The General Manager of the Hartford (Connecticut) Gaslight Company, Mr. B. W. Perkins, gives in the "American Gas Institute News" some particulars of a successful plan he employs for pumping tar from the separating tank into storage without loss of ammoniacal liquor. The tar and liquor from the entire plant are run into the first tank, the overflow from which runs into a second tank of about the same size. In the first tank a 20-inch pipe with three legs, 5 inches long, is placed at any convenient point, and inside this is placed the suction from the tar-pump at such a height from the bottom that the pump will lose its suction before the tar reaches the end of the 20-inch pipe. The length of the suction pipe can be found by experiment or measurement.



Tar Pumping Plant at the Hartford (Conn.) Gas-Works.

If a tank is nearly full of tar it will take several days to bring it down to the proper level, as levels have to be re-established by incoming liquor; but as pumping is done at regular periods it can be kept at the proper level thereafter. As there is always an emulsion of tar and liquor on the top of the tar, the suction pipe should be short enough not to remove any of this.

With this plan, it is impossible to pump any ammoniacal liquor with the tar, as often happens from inattention, or from a wrong measurement of the tanks before pumping.

American Chemical Society.—A feature of the fifty-first meeting of the Society, to be held at Seattle (Washington), will be two symposiums by the Industrial Division, one a general symposium especially devoted to the progress of chemistry in special lines of chemical industry. Papers have been promised pointing out the influence of the chemist upon various industries, and his accomplishments therein, including iron and steel, petroleum, and illuminating gas. A symposium will also be held on the Distillation of Wood.

Natural Gas Charges in America.—The Public Service Commission of the State of New York have made an order approving the stipulation settling the complaint as to rates of the Trustees of the village of Perry against the Pavillion Natural Gas Company. The Commission authorize a new schedule putting in force discounts, the refusal of which by the Company brought about the complaint. The new schedule provides a rate of 40 c. per 1000 cubic feet, off which the Company will give discounts, upon payment by a stipulated date, ranging from 5 c. to 12½ c. per 1000 cubic feet, according to the amount of gas used. This arrangement will remain in force for one year.

Munitions Inventions Branch.—The Minister of Munitions has constituted a Munitions Inventions Branch of the Ministry, and has appointed as Comptroller Mr. E. W. Moir, M.Inst.C.E., M.Am.Soc.C.E. The branch, which for the present is located in Armament Buildings, Whitehall Place, will have the duty of considering projects for inventions relating to munitions for warfare on land or matters appertaining thereto. The Comptroller and staff of the branch will be assisted in their work of examination, and, if thought necessary, in the investigation and development of any projects that may be considered worth being developed, by a panel of honorary scientific and other experts. Among those who have accepted Mr. Lloyd George's invitation to act on this panel may be mentioned Mr. Horace Darwin, M.A., F.R.S., the Chairman of the Cambridge Scientific Instrument Company, Mr. A. M'D. Duckham, Dr. Sebastian Z. de Ferranti, Professor Glazebrook, F.R.S., Professor J. S. Haldane, F.R.S., Sir Alexander Kennedy, F.R.S., Professor Vivian B. Lewes, Mr. W. H. Maw, M.Inst.C.E., Mr. James Swinburne, F.R.S., Sir J. J. Thomson, F.R.S., and Mr. A. J. Walter, K.C.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Dutch Mantle Manufacture.

Sir,—In the "Journal" for the 27th ult., Mr. Engel, the Managing-Director of the Gautzsch Company, of Amsterdam, makes a number of very interesting statements about the history and aspirations of his Company; but we think your readers will agree that the statements which he carefully does not make are likely to be much more illuminating than what he actually does say. For instance, it is of great interest to us, and other of your readers concerned in the doings of the German Mantle Trust, to know that Mr. Gautzsch is supplying a large number of the pre-war customers of the German Auer Company, and that he is sending to them goods which are practically identical in all respects with what they received before the war.

Mr. Engel is also fortunate in having (as we understand from good authority that he has had) the assistance and advice of Messrs. Schwartz, Feuer, and Hirsch in the conduct and arrangements of his Dutch factory. We are to understand also that it was from a purely philanthropic motive that these gentlemen from the Auer Company loaned to him a number of machines and German girls to demonstrate to his Dutch employees. We should be glad if we could obtain another such hundred super-Dutch girls as those Mr. Engel has, to manufacture here the same quantity of mantles as he is able to turn out from the Amsterdam factory. They would be of more use to us, judged by the quantity of mantles that he has already sold in England, than the six hundred of our present staff.

With regard to the statements that the Home Office have approved a list of Dutch shareholders in the Gautzsch concern, we would insinuate that another Government Department—namely, the India Office—was hoodwinked by the Auer Company in connection with the Travancore Minerals Company, where the holding of the Auer Company was, as we pointed out in September last, and has since been proved to the satisfaction of H.M. Government, three-quarters of the entire capital, although apparently all was held in British hands.

We have, unfortunately, not sufficient evidence to enable us to state with regard to Messrs. Gautzsch that they are in the same position as the Travancore Minerals Company; but with regard to their pure Dutch origin we "ha'e oor doots."

If the Auer Company are really not holders, through Dutch nominees, of shares in the Gautzsch Company, perhaps Mr. Engel will enlighten your readers as to the exact relations—intimate as we know them to be—between the two concerns.

Charles S. Garland,
Works Manager of the Volker Lighting Corporation, Limited.

Garratt Lane, Wandsworth, Aug. 16, 1915.

Badges for Gas-Works' Employees.

Sir,—With further reference to the question of the issue of private badges to gas-works' employees, which has already been approved by the War Office, I have received a letter from the Ministry of Munitions of War in the following terms:—

Aug. 9, 1915.

> "With further reference to your letter of the 30th of July, I have to inform you that private badges approved by the War Office or Admiralty may be continued to be used in conditions set forth in par. 8 of the enclosed rules. I may add for your information, however, that the Ministry of Munitions will in due course offer to substitute the official badge for the use of skilled and semi-skilled indispensable workmen of certain occupations employed by those firms who have distributed approved private badges to their employees."

Par. 8 of the Munition (War Service Badges) Rules referred to reads as follows:—

> "Any person to whom before the date of these rules [July 23] any badge was issued by or with the express authority of the Admiralty or Army Council may—anything in these rules to the contrary notwithstanding—continue to wear such badge so long as he remains in his present employment, until such date, not being earlier than the 30th of September, as the Minister may determine, either generally or in any particular case or class of cases."

W. T. Dunn, Secretary,
Institution of Gas Engineers.

39, *Victoria Street, S.W.*,
Aug. 12, 1915.

Rossendale Union Gas Company.—The report of the Company for the half year ended June 30 refers to the loss sustained by the death of Mr. H. W. Ashworth, who was a Director for 25 years, and Vice-Chairman for nine years. The sales of gas showed a decrease of 4·36 per cent. on the corresponding period of 1914. The statutory dividends, ranging from 10 per cent. on the original shares to 5 per cent. on the new preference shares, are recommended. Sales of gas realized £15,885, and residual products £4670. The profit was £5386.

Market Drayton Public Lighting.—The Local Government Board have forwarded to the Market Drayton Urban District Council a copy of a letter received by them from a ratepayer asking for an inquiry "concerning the unnecessary increase in the rates of the town through an extra expenditure being incurred for installing electric light in the street-lamps, in place of the well-illuminated gas-lamps which now exist." The letter added that the amount would be between £300 and £400, which would mean a 1d. rate. In reply, the Clerk pointed out that the writer was an employee of the Gas Company, "whose tender had not been accepted." He remarked that the Council had received many expressions of dissatisfaction with the gas lighting, and that a clear saving would be effected by the acceptance of the tender of the Electric Light Company.

REGISTER OF PATENTS.

Bunsen Burner Apparatus.

Welsbach Light Company, Limited, of Grays Inn Road; a communication from the Deutsche Gasglühlicht Actien-Gesellschaft (Auergesellschaft), of Berlin.

No. 27,955; Dec. 4, 1913.

For the heating of flat irons, soldering irons, &c., which are continually being moved while in use, the employment of a bunsen burner, the patentees state, has the disadvantage that the motion interferes with the suction process effected by the jet of gas issuing from the nipple—the result being that both combustion and heating are irregular.

The aim of the present invention is to overcome such difficulties by providing, independently of the burner proper, a mixing chamber in which a nozzle supplied with compressed air is arranged adjacent to the gas supply; and this supplies a part only of the air required. By means of the motion of this air current, the remaining air necessary is sucked in, mixes with the gas, and passes through a flexible tube to the burner proper, where combustion takes place. The regulation of the flame is effected by the compressed air and the gas being led into the same cock, and from this into the mixing chamber.

Manufacture of Ammonium Sulphate.

Johnson, J. Y.; a communication from the Badische Anilin und Soda Fabrik, of Ludwigshafen on-Rhine, Germany.

No. 27,962; Dec. 4, 1913.

In their specification, the patentees remark that it is known that by treating calcium sulphate (for instance, gypsum) with either a dilute or a concentrated solution of ammonium carbonate, or of ammonium bicarbonate, double decomposition takes place, resulting in the formation of ammonium sulphate and calcium carbonate. In cases in which ammonium bicarbonate is used, it may be necessary to complete the decomposition of the calcium bicarbonate formed—for instance, by heating the mixture. Hitherto this simple reaction has been but little used owing to the difficulty of separating the fine precipitated calcium carbonate from the ammonium sulphate solution and of completely recovering the ammonium sulphate from the calcium carbonate mud. The methods of filtering—making use of apparatus (such as filter presses and the like) which have hitherto been used for analogous separation purposes—have proved but of little value, because large quantities of water are required in such apparatus for washing the finely divided precipitate, and the cost of subsequent evaporation is consequently too high; and, further, the calcium carbonate is unevenly and incompletely washed out, so that some ammonium sulphate is lost.

What the patentees claim as their invention is: (1) The manufacture of ammonium sulphate practically free from calcium salt by treating calcium sulphate with ammonium carbonate or bicarbonate in the presence of water, then filtering the solution so that the carbonate sets on the filtering surface in a continuous adherent layer of uniform permeability, and then washing the layer of carbonate with water until it is practically free from ammonium sulphate. (2) The manufacture of ammonium sulphate practically free from calcium salt, by treating calcium sulphate with ammonium carbonate or bicarbonate in the presence of water, then dipping into the suspension obtained a hollow frame or box, having at one (or more than one) of its sides a filtering membrane or its equivalent, placing the inside of the frame or box under less pressure than the outside, and drawing off from inside the frame or box liquid which passes through the membrane, then surrounding with water the frame or box and the calcium carbonate adhering to it, and then continuing to apply reduction of pressure at the inside of the frame or box until the calcium carbonate has been sufficiently freed from ammonium sulphate.

Obtaining Ammonia from Solid Fuel.

Sachs, D. K., of Berlin.

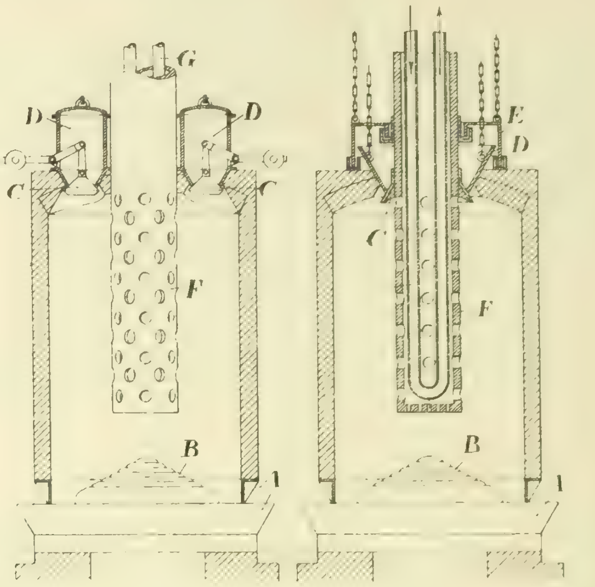
No. 28,735; Dec. 12, 1913. Convention date, Dec. 12, 1912.

This invention relates to a process for increasing the yield of ammonia in the gasification of solid fuels by discharging the whole of the gases from the interior of the fuel bed immediately at the point of their generation, through pipes, the temperature of which is reduced by cooling devices, so that the gases entering therein are no longer decomposed. The pipes have arranged in the interior separate cooling pipes through which a constant current of water is caused to pass. With such cooled discharge pipes it is said to be possible to obtain up to 90 per cent. of the nitrogen of the fuel in the form of ammonia.

The use of a central tube has already been proposed, the patentee remarks, in gas-producers for drawing-off the generated gas from the centre of the producer, which tube was provided with cooling devices; but as the discharge tube had openings only in the region of the upper layer of fuel, it was not adapted to draw off any ammonia produced, since the latter would be liable to decompose on the way to the discharge openings—the cooling devices thus serving not for obtaining ammonia, but for utilizing the heat contained in the discharged gases.

Two constructions according to the invention are illustrated. The cooled pipe is shown in the first in elevation and in the second in section; but it is of the same construction in both. For the rest, the two differ from each other as regards the charging devices. In No. 1 the generator casing is provided in the usual manner with a water seal A and a conical grate B. Two charging devices are provided consisting of closing cones C and charging hoppers D. In No. 2, on the contrary, there is a single charging device provided with a bell E in addition to the closing cone C and the adjustable charging hopper D.

A pipe F with holes is inserted into the generator casing with a cooling coil G in the interior. The ammonia-containing gases generated in the interior of the fuel pass in a nascent state through the holes into the pipe F, in which they are at once cooled by the coil to such an extent that their temperature is below the decomposition temperature of ammonia; so that the ammonia contained in the gases, as soon as they have reached the pipe F, can no longer be decomposed.



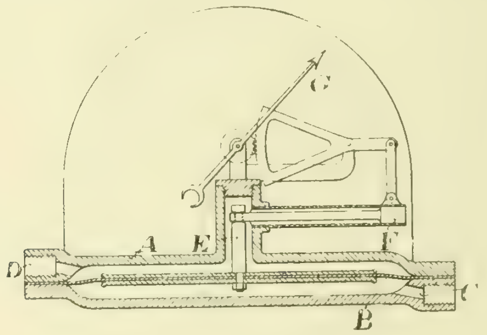
Sachs' Ammonia Recovery Plant.

Indicating and Recording Differences of Pressure.

Roschanek, O., of Vienna.

No. 9738; April 20, 1914. Convention date, April 21, 1913.

This invention has for its object to provide a device for accurately determining small differences of pressure between two quantities of fluid as distinguished from devices in which the pressure of a fluid is measured against the atmosphere pressure within the instrument. The appliance consists of two chambers each in connection with a fluid supply separated by a diaphragm, so arranged that any difference of pressure on the two sides of it causes the movement to be transmitted by a mechanical connection to one of the walls of the instrument, which becomes distorted to an extent proportional to the pressure to be measured; the distortion being then transmitted to an indicator or recording apparatus of known form.



Roschanek's Pressure Recorder.

A sectional elevation is given of one form of the apparatus, provided with a flexible tube.

In the casing A a relatively large diaphragm B is secured, which is acted upon by the two pressures, the difference of which it is desired to determine. The two pressures are transmitted through openings C O into the compartments below and above the diaphragm. The diaphragm, which is normally completely free from any load, may be provided in the centre with a stiffener either on one or both sides. In the form illustrated, it supports in the centre a spindle E connected to a rod secured at F to a flexible tube fixed at its other end on the casing and communicating with the interior. The displacement of the diaphragm produced by the difference of the pressures existing on both sides of the diaphragm is transmitted to the rod which therefore bends the tube, the displacements of which are transmitted without any friction, to turn an index G, recorder or the like, preferably through the medium of a device increasing the movement.

Gas-Valves and Means for Operating them.

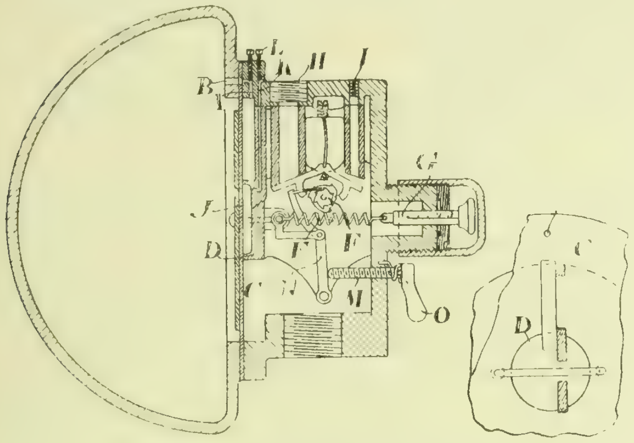
Bröndum, M. V., of Aarhus, Denmark.

No. 10,186; April 24, 1914.

Gas-valves, the patentee points out, are sometimes operated (through the medium of a ratchet mechanism) by a diaphragm separating two chambers communicating with one another by a narrow duct, so that, while gradual variations in pressure are equalized through the duct, any sudden increase in pressure causes the diaphragm to be deflected for reversing the position of the valve. The present invention relates to a device of this kind. It consists essentially in the provision of a dished diaphragm support against the mouth of which the diaphragm is held by an adjustable spring so as to restrict the area on which the gas pressure initially acts—the cavity of the support being in communication with the atmosphere by a narrow duct which, by the admittance of air, allows the diaphragm finally to leave the support and take up the full force of the pressure.

A vertical section of the apparatus and a front view of some of its parts are given in the illustrations, the *modus operandi* of which is as follows.

The main illustration shows the normal position of the elements. Any gradual change in pressure is equalized in the two gas-chambers through the ducts A B, so as not to affect the diaphragm C. Since the gas only escapes slowly through the ducts, however, any sudden increase in pressure will force the diaphragm away from the support D in opposition to the spring E. As the diaphragm is initially protected by the support, the diaphragm area will be correspondingly restricted, so that the pressure cannot at once act with its full force. As soon as the diaphragm leaves the support, however, the pressure will be able to act on the entire area of the diaphragm, so that the spring can be tensioned sufficiently for turning the wheel F through one tooth space.



Brondum's Gas-Lamp Valve Adjuster.

The sudden increase in pressure necessary for the actuation of the diaphragm will therefore under all conditions depend upon the tension of the spring, and such tension can be regulated by means of a sliding piece G so as to represent a certain percentage of the normal gas pressure whether this be high or low. As soon as the pressure is relieved or equalized through the ducts A B, the diaphragm will be restored by the spring to its normal position, and the ratchet-wheel will be turned through one tooth space—the valve lever being at the same time reversed for opening the lamp outlet H and closing the pilot flame outlet I. The pressure in the cavity J will be gradually relieved through the ducts K L, the capacity of which can be regulated by means of the screw shown. When at the next sudden increase in the pressure the operation is repeated, the lamp flame will be extinguished and the pilot flame turned on.

The device can also be operated by hand, for which purpose a screw M is arranged in the wall of the casing so as to bear against the lever N and rock it when turned by the thumb-piece O.

Finding the Position of Gas or Water Pipes.

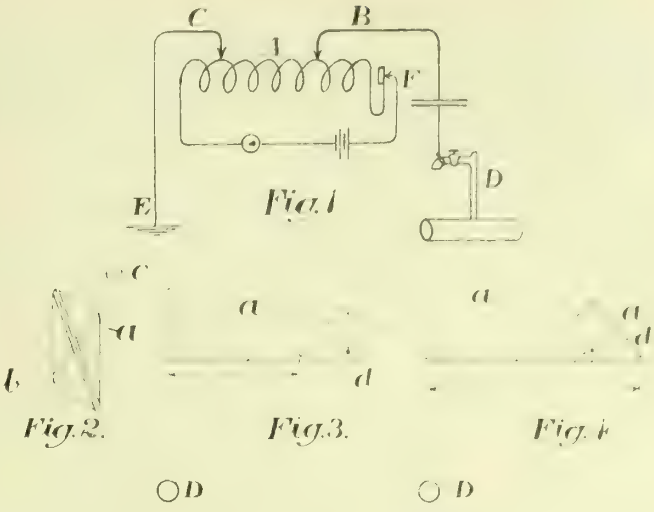
Sharman, A. W., of Wandsworth Common, S.W.

No. 16,799; July 14, 1914.

The purpose of this invention is to provide apparatus whereby the presence and position of gas or water pipes, &c., "can be determined with accuracy when buried in the ground or concealed from view in walls or the like."

Heretofore, the patentee remarks, methods have been proposed in which the pipe is made part of a metallic electrical circuit through which pulsating currents are passed; the instrument generating usually the secondary of a small induction coil, the impulses being connected to both ends of the part of the pipe being searched for. This necessarily entails the use of connecting wires at least as long as the portion of pipe under survey. Several objections arise to this method. In the first place, since the wire carries the same current as the pipe, confusion is likely to result. In the second place, if public roads intervene between the two points on the pipe to which the wires are connected, this arrangement is obviously extremely inconvenient. In the method he suggests only one connection to the pipe is required. The generating instrument is attached by one of its terminals to a point on the pipe, while the other terminal is connected to earth by means of a plate of metal or a peg, or some other convenient way. Under these conditions, "the impulses imparted to the pipe travel along it for surprisingly long distances before finding a way back through the earth." Also in the method adopted the series of electrical impulses or momentary currents —of short duration but of great intensity—are "characterized by a wave form which shows that the impulse attains the maximum current value in an exceedingly short period of time, and that its reduction to zero is also very abrupt."

Impulses of this character are readily obtained by connecting to two points along the winding of a low resistance iron cored induction coil A (fig. 1), two wires B C, which are respectively connected to the pipe system D and to an independent earth plate E situated some yards distant from the pipes. A direct current is allowed to flow through the inductive winding until the core is saturated, when it is suddenly interrupted—preferably by an automatic make-and-break device F such as is in common use in connection with medical and other induction coils. The sudden collapse of the field due to the current generates an impulse in the pipe system and independent ground plate—the current flowing mainly along the pipes and producing a pulsating magnetic field symmetrically around the pipes as a centre.



Sharman's Pipe Finder or Locator.

This pulsating field is detected and explored by the aid of search coil, fig. 2, or inductive circuit consisting of some twenty turns of insulated copper wire wound on a frame about 3 feet across. The component turns of wire are bound together so as to form a flexible multiple cable with all turns in series. This flexible circuit *a* during use is supported upon a wooden frame *b*; the cable being strained to the shape of the frame so as to embrace the largest possible area. The ends of the flexible circuit are connected directly (or in combination with a condenser) to the terminals of a telephone *c* or other detector of pulsating currents. The frame is provided with a plumb-bob *d* (fig. 3) or similar device which indicates when the plane of the coil or frame is vertical or measures the angle between the plane of the coil and the vertical.

In practice, the induction coil, together with the battery terminals and interrupter, is mounted in a portable case and provided with a starting switch, which may either be of the usual hand-operated form or may include contacts which are operated at regular intervals by the aid of a clockwork driven cam—the whole forming the "generator" of the system, the terminals of which are respectively connected to some point on the pipe system under test, D, and to an independent ground connection E, some yards from the pipes. This latter ground connection may take the form of a metallic peg driven into the ground at a suitable point.

The generator being brought into action, the operator takes the search coil frame, and while listening to the attached telephone holds the frame vertically and over the position where the pipe is assumed to be. The signal impulses from the generator will be audible in the telephone; and the sounds reach a sharp maximum when the plane of the search coil is vertically over the pipe run and parallel with it. Having determined the position and direction of the pipe, its depth at any point can be found by making a similar observation at a known distance on either side of its position. Maximum signals will now be obtained with the search coil frame tilted so as to be parallel with a radius draw from the pipe as a centre (fig. 3). If the lateral displacement is kept constant—say, at 5 feet—the angular scale combined with the plumb-bob may be calibrated to read the depth of the pipe direct in feet.

Apparatus constructed as described, and taking 6 watts for the generator, enabled, it is said, the gas and water pipes to be plotted over a radius of a quarter of a mile from the point at which the generator was applied.

An alternative method of determining the depth of a conductor consists in making an observation on one side of the pipe run as described herein and tilting the frame until signals cease (fig. 4). This position is very sharply defined. In this case the plane of the coil is at right angles to a radius drawn from the pipe, and the position is that of zero coupling.

Gas-Washers.

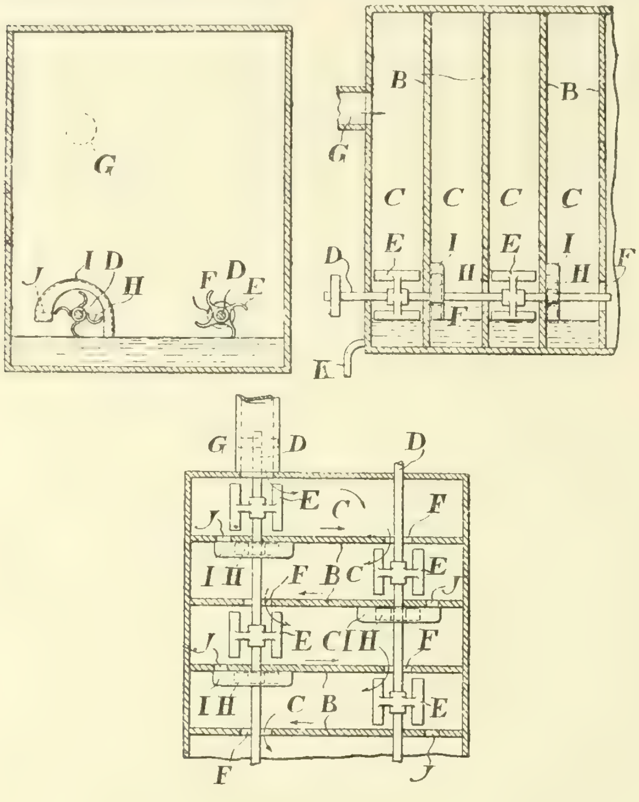
Davis, G. K., of Strand, W.C.

No. 17,005; July 17, 1914.

In his former patents (No. 2113 of 1909 and No 4543 of 1910), the patentee says he describes apparatus for washing gas comprising a casing divided into a series of chambers by transverse partitions provided with apertures for the flow of the gas through them, and shafts extending longitudinally through the casing and carrying fanners in each transverse chamber. The gases to be washed are compelled to travel either in a vertical or a horizontal zigzag manner through the several compartments, by the arrangement of the lateral apertures in the transverse partitions alternately at opposite sides. Furthermore, the washing liquid was allowed to travel by gravity throughout its length through apertures provided for the purpose. But he has now found, in practice, that it is necessary in some cases to effect a more intimate contact between the gas and the liquid than is obtainable by apparatus of the type described, and to this end he now proposes to utilize the centrifugal force created by the rapidly rotating fanners for the purpose of drawing the gas from chamber to chamber through the apparatus.

A transverse, longitudinal, and horizontal section of apparatus constructed according to the invention are given on p. 342.

The casing of the washer is of rectangular shape in cross section. B are the transverse partitions which divide it into a series of chambers. D are two shafts which extend longitudinally through the chambers, and E are fanners keyed upon the shafts—one fanner on each alternate shaft. They are arranged relatively to the liquor in the bottom of the casing, so that the tips of the blades dip slightly below the surface, whereby, when the shafts rotate, the blades catch a portion of the liquor and throw it up into the chambers in the form of spray. F are gas-passages provided in the partitions concentrically with the shafts and alternately at opposite sides of the partitions. G is the inlet through which the gas enters the first chamber, passing through the chamber and escaping through the passage in the partition into the next chamber. It then pursues the horizontal zigzag course, being assisted by the centrifugal action of the fanners behind the passages. H is a small water-wheel provided in each chamber upon the shaft with which it rotates. I is a deflector arranged above each water-wheel, and which directs the liquor thrown off the wheel in a tangential direction through the aperture J in the partition into the next compartment to that in which the wheel is situated. The diameter of the wheel is such that the correct level of liquor is maintained in the washer to give an efficient spray, and the width is proportioned to the amount of liquor which has to flow through the washer. K is the discharge pipe through which the liquor is withdrawn.



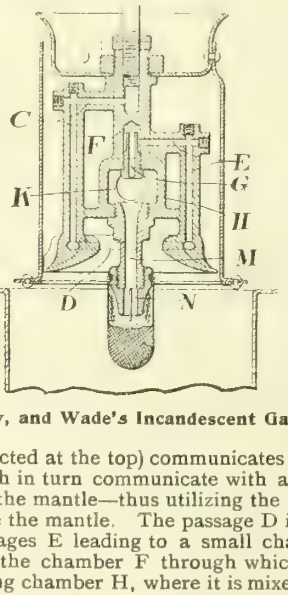
Davis's Gas-Washer.

Incandescent Gas-Lamps.

Aublet, Harry, and Co., Limited, and Wade, J. T., of Peterborough.

No. 17,099; July 18, 1914.

This invention relating to inverted incandescent gas-lamps refers to lamps in which means are provided for heating the gas to a high temperature during its passage from the supply pipe to the chamber where it is mixed with air before it enters the nozzle.



Aublet, Harry, and Wade's Incandescent Gas-Lamp.

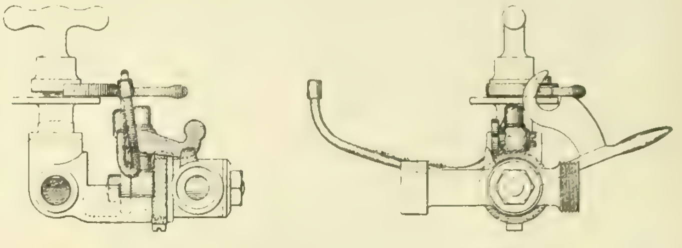
The gas-pipe (connected at the top) communicates with passage ways C in the casting, which in turn communicate with a passage D in the lower portion near to the mantle—thus utilizing the heat of the waste products as they leave the mantle. The passage D in turn communicates with other passages E leading to a small chamber F. G is a nipple screwing into the chamber F through which the heated gas emerges into the mixing chamber H, where it is mixed with air passing through a regulated opening K. M is a tube conveying the gas and air mixture to the mantle fitted at the lower end with a clay nozzle which extends some distance into the mantle, and is divided into two passages by a thin partition of nickel or other suitable material which drops into grooves provided for it so as to form a twin discharge of the combustible mixture into the mantle.

Water and Gas Taps for Geysers.

Joseph Breeden and Co., Limited, and Breeden, F. V., of Birmingham.

No. 22,449; Nov. 13, 1914.

This invention relates to taps so arranged that the supply of gas cannot be turned on before the water tap is turned on, and the latter cannot be turned off while the gas-tap is on.



Breeden's Water and Gas Tap for Geysers.

As shown, on the body of the water-tap is a preferably U-shaped arm or bracket terminating in a ring or collar, to which the body of the gas-tap is fixed with the axis of its plug at right angles to the axis of the water passage or way of the water-tap. One edge of the U arm constitutes a limiting stop for the projecting gas-tap handle, which carries a projecting arm with a hooked shaped end. To the water-tap is pivoted a lever having a part near the axis or fulcrum which bears on a flange on the stem of the tap when the tap is turned off, and thereby prevents the turning of the lever. When the water-tap is turned on the flange on the stem of the tap is raised, and consequently the lever is free to be turned. The handle of the lever is engaged with the hook-shaped end of the projecting arm on the handle of the gas-tap; consequently, when the water-tap is turned off the handle of the gas-tap is locked in its "off" position, and when the water-tap is turned on the handle of the gas-tap is free to be turned "on," and in its angular motion it effects the turning of the lever on the water-tap and the carrying of its curved arm under the flange of the stem of the handle of the water-tap, which, therefore, cannot be turned off prior to the turning off of the gas-tap.

APPLICATIONS FOR LETTERS PATENT.

11,181.—Yates, H. J., and Thorp, F. & H. T., "Prepayment meters." Aug. 3.

11,269.—Noonan, J. H., "Gas cooking-apparatus." Aug. 4.

11,281.—Rigg, J., "Atmospheric burners." Aug. 4.

11,315.—British Coke-Ovens, Limited, and Schuster, N., "Scrubbers." Aug. 5.

11,347.—Purser, A., "Fixing patches or branch pieces to pipes." Aug. 5.

11,350.—Jacks, T., and Rowlson, B., "Coal gas or water gas heat and steam producer." Aug. 6.

11,377—Cutler, S., jun., "Feed-device for gas-generators." Aug. 6.

11,378.—Miller, R., "Mantles and burners." Aug. 6.

PARLIAMENTARY INTELLIGENCE.

GAS AND WATER PROVISIONAL ORDERS FOR 1915.

Report by the Board of Trade.

The Board of Trade last week issued a report on their proceedings during the past session under the Gas and Water Works Facilities Act, 1870. It shows that in December, 1914, fourteen applications were made for Provisional Orders under the Gas and Water Works Facilities Act, 1870. Of these, eleven related to gas undertakings, one to a gas and water undertaking, and two to water undertakings. The amount of capital proposed to be authorized was £196,500 by shares, and £98,776 by loan, of which £186,000 share and £86,826 loan capital was for gas; and £10,500 share and £11,950 loan capital for water purposes. The Gas Orders related to Cheadle, Guildford, Heathfield and Waldron, Liverpool, Melton Mowbray, Mid-Kent, Oakham, Rothwell, Staveley, Swanage, and Thirsk; the combined Gas and Water Order to Hoylake and West Kirby; and the Water Orders to Fisherton Anger and Bemerton, and Thirsk District.

ORDERS AND OBJECTS.

The principal objects of the applications were as follows:—

Cheadle Gas.—To empower the Cheadle Gaslight and Coke Company, Limited, to maintain and continue their existing gas-works, to construct and maintain additional works, to manufacture and store gas, and to supply gas within the parish of Cheadle, in the county of Stafford.

Fisherton Anger and Bemerton Water-Works.—To make provision with regard to the capital of the Fisherton Anger and Bemerton Water-Works Company, and to sanction and confirm the issue by the Company of certain debenture stocks.

Guildford Gas.—To define and extend the limits for the supply of gas by the Guildford Gaslight and Coke Company, to empower the Company to raise additional capital, to repeal the powers of the Woking Water and Gas Company and the Cranleigh Gas and Coke Company, Limited, to supply gas in part of the extended limits, and to change the name of the Woking Water and Gas Company to the Woking Water Company.

Heathfield and Waldron Gas.—To empower the Heathfield and Waldron Gaslight and Coke Company, Limited, to maintain and continue their existing gas-works, to manufacture and store gas, and to supply gas in the parishes of Heathfield and Waldron, in the county of Sussex.

Hoylake and West Kirby Gas and Water.—To empower the Hoylake and West Kirby Gas and Water Company, Limited, to raise additional capital and to construct and maintain additional works for the manufacture and storage of gas, and to confer on the Company further powers in respect of their water undertaking.

Liverpool Gas.—To extend the limits for the supply of gas by the Liverpool Gas Company, to authorize the transfer to the Company of the gas undertaking of the Liverpool Corporation in the township of Fazakerley, to repeal the Liverpool Corporation (Fazakerley) Gas Orders, 1906 and 1911, and to make provision with respect to the establishment of a profit-sharing scheme by the Company.

Melton Mowbray Gas.—To extend the limits for the supply of gas by the Melton Mowbray Gaslight and Coke Company, Limited, and to empower the Company to raise additional capital.

Mid-Kent Gaslight and Coke.—To empower the Mid-Kent Gaslight and Coke Company to raise unissued capital by preference shares.

Oakham Gas.—To define and extend the limits for the supply of gas by the Oakham Gas Company, Limited, and to empower the Company to raise additional capital.

Rothwell Gas.—To empower the Rothwell Gaslight Company to raise additional capital.

Staveley Gas.—To extend the limits for the supply of gas by the Staveley Gaslight and Coke Company, Limited, to sanction and confirm the acquisition by the Company of certain lands and the construction thereon of certain existing gas-works, to empower the Company to construct and maintain additional works, and to raise further capital.

Swanage Gas.—To cancel the water capital of the Swanage Gas Company and to repeal the provisions of the Swanage Gas and Water Acts, 1901 and 1912, so far as they relate to such capital, and to make provision for the application of the assets of the water undertaking.

Thirsk Gas.—To empower the Thirsk Gas Company to raise additional capital and to construct and maintain additional works for the manufacture and storage of gas.

Thirsk Water.—To extend the limits for the supply of gas by the Thirsk District Water Company, Limited, to empower the Company to raise additional capital, and to construct and maintain additional water-works.

Two of the applications—those from Cheadle and from Heathfield and Waldron—were in respect of existing non-statutory undertakings. The remainder were in regard to undertakings already authorized by Special Acts or Provisional Orders.

Opposition.

No objections were lodged against the Mid-Kent, Rothwell, and Thirsk gas applications; and those lodged against the Heathfield and Waldron, the Oakham, and the Swanage applications were subsequently withdrawn. The objections and representations made with regard to the other applications were duly considered by the Board.

The promoters of the Guildford and Melton Mowbray applications failed to obtain the consent of certain local and road authorities, and requested the Board to exercise their powers under section 4 of the Gas and Water Works Facilities Act, 1870, and to dispense with the consent of the authorities. After holding an inquiry in each case, the Board decided to dispense with the consent of the authorities concerned, and to grant the Provisional Orders applied for, subject to certain modifications and amendments which appeared to them to be desirable. A special report was laid before Parliament in these cases.

In the case of the Hoylake and West Kirby applications, objections were lodged by the Birkenhead Corporation. At the inquiry which was held by the Board, it appeared that the Corporation and the Hoylake and West Kirby Gas and Water Company, Limited, the promoters of the application, possessed concurrent powers to supply gas and water in certain areas. The Board endeavoured to obtain an arrangement between the parties, whereby the overlapping of their limits of supply might be avoided; and they understand that such an arrangement has now been entered into, and that steps will be taken to make it statutory at the earliest opportunity.

The Board granted Provisional Orders in respect of all the applications made to them.

Price of Gas.

A maximum price per 1000 cubic feet was fixed in the following Provisional Orders: Cheadle, 5s.; Heathfield and Waldron, 5s. 6d.

The undertakers of the Guildford Order have at present a standard price of 3s. 6d. for gas supplied within a radius of 2 miles of their works, and of 4s. for gas supplied beyond that radius; but no increase of dividend may take place when the actual price of gas is above 3s. within the radius of 2 miles, or 3s. 6d. beyond that radius. Under the Provisional Order a uniform standard price of 3s. 6d. is fixed, as from the 1st of January, 1916; but no increase of dividend may take place when the actual price exceeds 3s. The undertakers may, however, make an extra charge, not exceeding 6d., within their limits of supply outside the borough of Guildford and beyond a radius of 2 miles from the gas-works, and a further extra charge, not exceeding 6d., within their limits of supply outside the borough and beyond 4 miles from the gas-works.

Under the Melton Mowbray Order, the existing standard price of 4s. is retained; but the undertakers are given power to make an extra charge, not exceeding 10d., within the additional limits of supply authorized by the Order.

The existing standard price of 4s. 6d. is retained in the Oakham Order; but the undertakers are given power to make an extra charge, not exceeding 6d., in part of the additional limits of supply authorized by the Order.

By the Staveley Order, a standard price of 4s. is substituted for the existing maximum price of 5s.

Illuminating and Calorific Power.

An illuminating power of 14 candles is prescribed in the Guildford, Heathfield and Waldron, Oakham, and Thirsk Gas Provisional Orders; and in the three last mentioned Orders the "Metropolitan" argand No. 2 burner is prescribed as the testing burner. The illuminating power previously prescribed was 15 candles in the case of the Guildford and Oakham undertakings, and 14 candles in the case of the Thirsk undertaking.

No provisions as to the testing of illuminating power were inserted in the Cheadle and Staveley Orders; but provisions for the testing of the calorific power of the gas supplied by the undertakers were inserted instead. These provisions provide for a standard calorific power of 500 B.Th.U., and make the undertakers liable to penalties if this standard is not maintained.

Special Provisions.

The Cheadle Order contains a clause limiting the price of gas for public lighting to four-fifths of the highest price charged to ordinary consumers, and also a clause allowing the undertakers to sell their undertaking to any local authority within the limits of supply which shall be authorized to purchase it.

A clause has been inserted in the Heathfield and Waldron and the Thirsk Gas Orders limiting the powers of the undertakers to pay back-dividends to within five years of the payment of a deficient dividend, and a clause in the Thirsk Water Order prohibits the payment of any back-dividends.

The Liverpool Order contains provisions authorizing the transfer of the Fazakerley gas undertaking of the Liverpool Corporation to the Liverpool Gas Company. Power to grant an Order, under the Gas and Water Works Facilities Act, 1870, containing such provisions was conferred on the Board of Trade by section 66 of the Liverpool Gas Act, 1914. The Order also contains provisions with regard to a profit-sharing scheme.

The Melton Mowbray, Oakham, and Staveley Orders contain provisions with regard to the disposal of a part of the balance carried forward by the undertakers in order to reduce such balance to a sum not exceeding one year's dividends.

Under the Swanage Urban District Water Act, 1913, the water undertaking of the Swanage Gas Company was transferred to the Swanage Urban District Council; but the water capital of the Company was not cancelled. The Swanage Order cancels the water capital of the Company, and provides for the distribution of the assets of the water undertaking.

Provisions have been inserted in the Fisherton Anger and Bemerton Order to regulate the capital of the undertakers. A clause has also been inserted providing for the purchase of the undertaking by the Salisbury Corporation.

A clause in the Hoylake and West Kirby Order restricts the undertakers from charging for water supplied to baths during the present war, and afterwards without the consent of the Board of Trade.

A clause has been inserted in the Provisional Orders prohibiting the raising of money during the war, and within one year after the termination thereof, without the consent of the Treasury.

Clauses have been inserted, by agreement, in various Provisional Orders for the protection of road and other authorities.

CONFIRMATION BILLS.

Bills to confirm the Orders were introduced in the House of Commons as follows: Gas and Water Provisional Orders (No. 1) Bill, to confirm Provisional Orders relating to Oakham Gas, Staveley Gas, Thirsk Gas, and Thirsk District Water; Gas and Water Provisional Orders (No. 2) Bill, to confirm Provisional Orders relating to Guildford Gas, Melton Mowbray Gas, Swanage Gas, and Hoylake and West Kirby Gas and Water; Gas and Water Provisional Orders (No. 3) Bill, to confirm Provisional Orders relating to Cheadle Gas, Heathfield and Waldron Gas, Liverpool Gas, Mid-Kent Gaslight and Coke, Rothwell Gas, and Fisherton Anger and Bemerton Water.

Opposition in Parliament.

A petition was deposited in the House of Commons against the Gas and Water Provisional Orders (No. 2) Bill by the Cheshire County Council; but an agreement was come to between the parties, and the petition was withdrawn. The other two Bills were unopposed.

Royal Assent.

All the Bills to confirm the Orders received the Royal Assent on July 29.

Death from Injured Thumb.—A verdict of "Accidental death" was returned by a Coroner's Jury who inquired into the circumstances attending the death of Thomas Jones, a stoker at the Windsor Street Gas-Works of the Birmingham Corporation. Deceased was placing some bars in a furnace, when he sustained a slight injury to his thumb. A few days later, he became ill; and on admission to the Erdington Infirmary, he was found to be suffering from blood poisoning, which proved fatal.

High-Pressure Lighting for H.M. Government.—The Welsbach Light Company, Limited, have been instructed by the War Department to carry out an installation of high-pressure and low-pressure gas lighting at the new ammunition inspection shops at Park Royal. The high-pressure lamps being installed are the "Pharos-Welsbach;" the low-pressure lamps are the Company's "Victor" indoor type; and the compressors are the "Welsbach Bryan-Donkin." The installation also comprises seventy-four duplex soldering stoves.

MISCELLANEOUS NEWS.

THE MARKET FOR SULPHATE OF AMMONIA.

The Dangers Ahead—Need for Organization and a Definite Policy.

[From a brochure issued by the Sulphate of Ammonia Association.]

The disastrous fall in prices in 1896 brought about a crisis in the sulphate of ammonia market, and led British manufacturers to form their first Association to further the interests of the trade. This fall, from £12 to £13 per ton in 1893-4 to £7 to £8 per ton in 1896-7, was due chiefly to the operation of the law of supply and demand. Production had outrun consumption; and the active propaganda work of the Permanent Nitrate Committee was inducing agriculturists to spend what money they could afford for manures on nitrate of soda rather than on sulphate of ammonia.

The late Colonel Sir S. A. Sadler and Mr. W. G. Blagden may be said to have been the "onlie begetters" of the movement towards cooperation which resulted in the formation of the Sulphate of Ammonia Committee in July, 1897. Associated with them, as members of the first Committee, were Messrs. Isaac Carr, Francis T. Cotton, Robert Dempster, William Fraser, John Fyfe, Edward Harman, R. G. Perry, and Hanbury Thomas, who have continuously given their energy, thought, and time to the objects in view from 1897 to the present day.

The most eloquent testimony to the work of the Committee, acting in concert with similar propaganda bodies on the Continent, is the fact that the consumption of sulphate of ammonia in the world has risen from about 250,000 tons in 1896 to 1,250,000 tons in 1913, and that (in spite of ever-increasing production and severe competition from other forms of nitrogen) the price has been maintained at a level of £11 to £14 per ton, as compared with £7 to £8 when the Committee commenced operations.

Another Crisis is Approaching.

During the last few years, it has been evident that the sulphate of ammonia trade is approaching another crisis; and the appearance of synthetic sulphate of ammonia as a commercial product in 1913 convinced members of the Sulphate of Ammonia Committee that the scope of their work and influence would have to be largely increased if a repetition of the events of 1895-6 was to be avoided.

In view of the formidable array of well-organized competitors with whom they found themselves faced in the nitrogen market, British producers determined to form a Selling Association which should fully represent British sulphate of ammonia at home and abroad, and through which British manufacturers, acting together, should be able to exercise an influence in the world's markets commensurate with the weight of their production.

The outcome of this determination was the formation of the Sulphate of Ammonia Association in the autumn of 1914. The "Propaganda Branch" of the Association is carrying on the propaganda work of the Sulphate of Ammonia Committee. The "Selling Branch" is the central channel through which all British manufacturers may dispose of their sulphate of ammonia.

The nature of its work and the need it aims at supplying are fully explained in the following sections.

The Passing of the British Monopoly.

The principle of combination has long been recognized in the sulphate of ammonia trade. In many foreign countries it has taken the form of a Syndicate; and in Great Britain the same principle has been tacitly admitted ever since the first middleman began to buy sulphate of ammonia from different manufacturers, collect it into shiploads, and sell it to overseas consumers. This British form of combination, though very rudimentary, and possessing many very great disadvantages, nevertheless worked fairly well as long as the British manufacturer was by far the largest producer of sulphate of ammonia, and consequently had a monopoly of the world's markets. As long as the demand so far exceeded the supply of sulphate of ammonia that manufacturers were able to sell their salt at a price very largely in excess of its cost of production, there was no reason for them to trouble their heads about the particular methods by which these prices were obtained.

But a product which could be sold with such a large margin of profit was not likely to lack producers. The production of sulphate of ammonia was bound to increase; and it has increased enormously all the world over. Thirty years ago Great Britain was the only producer of consequence; to-day sulphate of ammonia is being made in every European country, as well as in the United States, Canada, Australasia, Argentina, India, Japan, and Russia. In spite of this enormous increase, sulphate of ammonia still figures as the *deus ex machina* in the *dénouement* of many a new coal, shale, or coke-oven company's prospectus—the sure guarantee of a dividend should all other products be worthless.

Sulphate of Ammonia a Primary Product.

But while the production of the salt as a bye-product has been, and is, increasing largely, sulphate of ammonia has to face the competition of other nitrogenous fertilizers, such as nitrate of soda cyanamide, or nitrolim, and nitrate of lime; and within the last eighteen months a new and inexhaustible source of supply of nitrogen has been successfully tapped and synthetic sulphate of ammonia placed upon the market on a commercial scale.

Great Britain no Longer the Largest Producer.

In 1911, the United Kingdom had to yield the first place as a producer of sulphate of ammonia to Germany; and a few manufacturers here soon became alive to the danger threatening overseas markets. The danger was seen to be all the more real because the German producers had long ago given up competing with one another, and had formed a powerful combination, controlled practically by one man with an advisory committee behind him.

What the Germans have Done.

With the formation of their Syndicate, the Germans deliberately adopted one policy, which they have ever since carried out with perfect consistency. They foresaw that unless they were able to increase their home consumption to a very large extent, their production would have to compete with British sulphate of ammonia in the overseas markets; and this competition would certainly lower the general level of price enormously. The Germans, therefore, set about increasing their own consumption—firstly, by admirably conducted experiments and propaganda work; and, secondly, by keeping their prices lower than the price of nitrate of soda, unit for unit. German prices have consequently often been lower than British prices, although the bulk of the German make was (and is) of 25 per cent. quality, as against British 24 to 24½ per cent.

In an interesting paper recently read before the Society of British Gas Industries, attention was drawn to this apparent anomaly.* In the discussion which followed, the conclusions drawn were that credit must be due to the British manufacturer for having obtained better prices for his inferior quality, and that it would not pay British manufacturers to make a better quality, seeing that they got better prices for 24 per cent. than the Germans did for 25 per cent. The founders of the Sulphate of Ammonia Association were not disposed to take so optimistic a view of the situation. They looked to the future rather than to the past; and their object in forming the Association was to put British manufacturers in a position to meet the dangers ahead.

Why They Did It.

The fact is that the Germans did not hold for higher prices because they did not want to do so. Their policy was to keep prices moderate, and develop their own consumption. But in spite of the enormous increase in home consumption which they were able to effect—from 96,000 tons in 1896 to 460,000 tons in 1913—their reports for the last few years have shown a growing anxiety as to the future of the market, in view of the very large increase in the production of nitrogenous manures throughout the world. This anxiety, and their determination to control and limit any new output of sulphate of ammonia as far as possible, became evident in the measures they adopted when the Badische Anilin und Soda Fabrik took them by surprise, in the autumn of 1913, by offering synthetic ammonia as a commercial product. The Syndicate and the Company came to terms, but only after a lengthy fight, which resulted in a heavy fall in the price of sulphate of ammonia all over the world. The Syndicate had to submit to very heavy monetary sacrifices; but they obtained control of the Company's sales.

A Result of German Nervousness.

Early in 1914 it was known that the supplies of nitrogen available to the world in 1914-15 might be about:

1,500,000 tons of sulphate of ammonia
2,700,000 ,, ,, nitrate of soda
300,000 ,, ,, cyanamide (nitrolim)
70,000 ,, ,, Norwegian nitrate of lime.

The German Syndicate came to the conclusion that production had outstripped probable consumption; and accordingly they began taking orders for forward delivery at prices at which British manufacturers were not willing to sell. In this way, very large quantities—totalling about 156,000 tons—were sold to America, Java, and the West Indies, for delivery during 1914 and the spring of 1915, while Spain, Japan, Ceylon, and Egypt were also invaded.

German Singleness of Purpose.

It may be remarked in passing that the Germans have always made a point of cultivating primarily those markets which offered the best guarantees of financial stability—*e.g.*, Java and America; leaving to British manufacturers and merchants markets like Japan and Spain, which have at times shown great financial weakness and require three or six months' credit. They have also shown a preference for "big deals," for which Java and America are also the best markets. In this, again, they have been pursuing a definite policy. They were determined to secure a safe outlet in the safest markets; and once having obtained a footing in these markets, they proceeded to strengthen their hold by delivering one standard quality of salt and packing, and one only—the best.

They were able to undertake very large orders within a few months, owing to the fact that each member of the combine has to be prepared to store a large portion of his make. When it is a question of export orders, therefore, German producers of sulphate of ammonia are able to act quickly, on a large scale, and as one man. As regards their home market, also, there is a complete understanding among the various groups.

Need for a Strong British Combine.

This was the situation which led manufacturers here to form the Sulphate of Ammonia Association in 1914. They were convinced that only by combination could the menace of German methods and organization be met.

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* The statement was erroneous in the form in which it was made, because the German prices compared were "net naked," while the Hull prices were "in bags and less 3½ per cent. discount." The following table gives comparative average prices in recent years:—

	British f.o.b. Hull, Net Naked 24½ per Cent.	German f.o.r. German Works, Net Naked. 25 per Cent.
1900	209·25	208·95
1905	237·00	233·45
1906	227·33	234·80
1907	222·44	228·25
1908	219·00	228·45
1909	212·16	222·70
1910	229·66	220·95
1911	260·58	232·50
1912	272·75	248·65
1913	253·33	255·20
1914	214·09	223·90

Prices in shillings per ton of 2240 lbs.

What was the British method of selling prior to the formation of the Association?

The British producer, as a rule, was not in direct touch with the export market. It would, indeed, be practically impossible for the 500 to 600 makers in this country all to be selling direct in foreign markets. The principle of combination alluded to above asserted itself as a necessity in the early days of the trade, and produced the export merchants. The export trade of the United Kingdom has now for many years been in the hands of comparatively few merchant-dealers. They have acted most efficiently as distributors; and the development of the export markets in many countries is due largely to their initiative and farsightedness in acting as bankers as well as suppliers to their customers. On the whole, they have worthily represented British trade. But the fact that the trade is in their hands, and that they are few in number, while the manufacturers are many, makes them to a large extent independent of producers; and the latter are thus deprived of adequate control of a market in which they have a vital interest.

Some Examples.

To take a simple instance, there has never been anything to prevent British merchants from placing orders with the German Syndicate. Indeed, British merchants have frequently been compelled to go to Germany for supplies, for the simple reason that the quantity of high-testing sulphate of ammonia produced here was not large enough to satisfy the demand from overseas consumers. For it must be remembered only a small proportion of British sulphate of ammonia tests 25 per cent., and only a portion of this is guaranteed at 25 per cent.

We have shown in our pamphlet entitled "Does it Pay to Make 25 per Cent. Ammonia?" why consumers prefer 25 per cent.* But from the British manufacturers' point of view, it is objectionable that German sulphate of ammonia should thus obtain a footing in what used to be British markets. The remedy lies in the British producer's own hands. Let him turn out a quality equal to German salt, let him combine to sell together with his fellow-makers, and he will be able to control the merchants and will hear less about German competition.

In respect of market information again the British manufacturer has hitherto been at a disadvantage compared with merchants. For the dealers are in close touch with all oversea markets as well as with all local home markets, whereas the manufacturer is to a certain extent isolated, and information takes longer to reach him.

It is obvious that occasions must arise when the opinions of merchants and manufacturers about the market differ considerably; and when this has happened in the past the merchants have always been able to persuade a certain number of producers that their view was the correct one. So that even if a majority of manufacturers here held the opposite view, they were unable to enforce it. Why not? Because there were no practical means of registering such a consensus of opinion even if it existed; still less was there any machinery available for giving practical effect to it.

Unity is Strength.

Now, in making these remarks, we are simply making a plain statement of facts, and the only conclusion we wish drawn from them is that manufacturers can never hope to gain a preponderating influence in the market until they are as well-informed as the dealers, and are prepared to take immediate and concerted action. This dualism of control in the English market tends to give the German Syndicate very marked advantages over British producers; for while merchants and makers here are disputing in the language of bids and counter-offers as to whether or no the time has come to sell, the Germans slip in and take the orders. This is especially the case with regard to forward orders. Very large consumers, like Java, are in the habit of securing their supplies, or a good part of them, many months before the actual time of shipment. If prices are considered favourable, many thousands of tons are bought within a comparatively short time.

How Export Orders are Placed.

Let us analyze in some detail how these orders are placed. We will suppose that we are in the month of June, and that Java is sending large inquiries for shipment during the following spring. Let us assume, also, that the Germans have come to the conclusion (as they did early in 1914) that there is likely to be an excess of nitrogen in the spring, and that they wish to sell 150,000 tons of sulphate of ammonia. They naturally turn to the markets in which 25 per cent. quality is best appreciated. Java is one of these. They ascertain at about what price British merchants are sellers, and proceed to under-quote them. In this way preliminary orders for a few thousand tons may be placed with Germany. Now, what is the position here? Merchants go to manufacturers with their inquiries, and endeavour to persuade them to make offers at a price which will compete with German prices. Each manufacturer here tends to consider the problem from the point of view of his own make, and is perhaps inclined to wait a few months longer before committing himself to spring selling—especially at what seems a low price.

The German's Opportunity.

The result is that the British merchant is placed in this dilemma—either he has to allow the orders to be taken by Germany or he has to take a very big speculative risk. It will depend on his view of the market as to which of these two alternatives he adopts. But even supposing he decides to undersell the Germans, he will not be willing to "sell short" more than a limited quantity. Fluctuations of 10s. and even 20s. per ton in the price of sulphate of ammonia are not uncommon; and it is therefore obvious that even those firms which command the largest financial resources will wish to limit their risks to a few thousand tons.

Another Advantage of Unity.

It is clear that in this respect the Germans have had very great advantages over producers here in dealing with business on this scale. A further very important advantage they have has to do with the rate of freight. It is a matter of common knowledge that shipowners are willing to make special terms for large quantities; so that as soon as the Germans have taken a certain number of orders they can go to their shipowners and save perhaps 2s. 6d. to 5s. per ton in extra rebates. It is obvious that a single shipper of very large quantities is in a better position to bargain with the shipowners than a number of merchants each with a small quantity.

Past Difficulties.

These, then, are some of the difficulties which confront British traders. We are not contending that our rivals have always done better than we have at the prices they have accepted, nor that there is any particular virtue *per se* in selling for far forward delivery. British producers in their anxiety to secure an outlet for their salt have often sold for forward at a discount, when they would have done better to wait. And even when it has been right to sell forward, the variety of competing interests—producer against producer and merchant against merchant—has brought prices down to an unnecessarily low level. But we wish to show that, owing to the peculiar manner in which the trade is carried on here, British manufacturers have hitherto not been able to gain a clear view of the position in the world's markets. Their opinions as to the right time for selling have necessarily been limited too much by the proportions of their own individual production; and mutual competition has made it impossible for them to take collective action.

Our Object.

The remedy for these "discontents" is to substitute combination for competition. That is the fundamental principle underlying the formation of the Sulphate of Ammonia Association. Our chief aim and object are to unite all British producers of sulphate of ammonia into one body; to use the large store of individual experience and wisdom for the common good; and thus to present a united front to foreign competition.

We have seen the same movement towards co-operation and combination developing among makers of sulphate of ammonia in the United States, France, Belgium, and Germany. In the nitrate of soda trade, producers have on various occasions taken effective common action in the interests of the trade as a whole. The various companies interested in cyanamide also have working arrangements delimiting their respective spheres of action. In the nitrogen market, as in many others, it seems certain that in future "the race will be to the swift, and victory to the strong." What is required is a strong and completely representative organization, with full powers to watch over the interests of British manufacturers and to take immediate action. It is this want which the Sulphate of Ammonia Association aims at supplying.

Dangers Ahead.

Some events have lately occurred which are of great significance in this connection. In the first place, it has come to our knowledge that the German Syndicate has approached a firm of allied nationality in an allied country asking them to carry on propaganda work for German sulphate of ammonia in that country during the continuation of the war; and the Syndicate state, in their report for 1914, that they have resolved to maintain the activity of their foreign offices as far as possible, in order to extend and develop their opportunities for selling after the war.

In the second place, a Bill has been introduced into the German Reichstag to create a commercial monopoly in nitrogen in Germany down to March 31, 1922. The preamble to the Bill states that owing to the increase in output of synthetic nitrogen and of the substitutes which have been found for nitrate of soda during the war, German nitrogen producers have made both German agriculture and industry (particularly the explosives industry) independent of foreign supplies, and that they will be able to meet the requirements of both in the future, provided the remunerativeness of the industry after the war is guaranteed by the establishment of a monopoly. And last, but not least, the Badische Company announce they will shortly be making at the rate of 300,000 tons per annum; so that Germany's production of ammonium sulphate will be about 800,000 tons a year.

What is the meaning of these events? It is this. That British sulphate of ammonia will to a far larger extent than ever before have to meet the competition of nitrate of soda in the world's markets. Germany consumed about 800,000 tons of nitrate of soda in 1913. If a nitrogen monopoly is created in Germany, these 800,000 tons of nitrate of soda will have to find an outlet in other markets. Stated in terms of sulphate of ammonia, this means that a quantity of nitrogen equal to about one-and-a-half times the production of the United Kingdom for 1914 may be thrown upon the market, in competition with our own increasing production.

This is one meaning of these events; the other is that, besides being able to supply all their own requirements, the Germans expect to be able to continue to export as well. In other words, the German producer is trying to entrench himself in his own country (whether to the ultimate benefit of consumers in the fatherland or no, remains to be seen), while reserving to himself complete liberty of action as regards export. Even if there is a large fall in the price of nitrogen throughout the rest of the world, the German manufacturer will not be immediately affected at home, whereas he will have it in his power to bring about just such a fall by appearing as a cheap seller in our markets. Having denied himself at home for some years in order to increase consumption in Germany by low prices, it may occur to him to encourage consumption abroad at the expense of the British manufacturer. It will be quite easy for him to keep prices low outside Germany by judiciously, and from time to time, offering a few thousand tons cheaply in overseas markets. The temptation to adopt these tactics will be all the greater if British manufacturers continue to sell on the good old principle of "Each for himself and Devil take the hindmost;" for this "principle" will give the German a guarantee of some measure of success. Of course, the monopoly may not be created—it is being vigorously opposed, especially by the Badische Company, who maintain that their cost of production is lower than that of the cyanamide producers—but even so we shall have to meet largely increased German competition. Indeed, without a monopoly the Germans will necessarily pay more attention to our export markets.

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* See "Journal" for July 20 last, p. 124.

The Only Way.

The only way to keep German sulphate of ammonia out of our markets is for British producers to agree to act and to sell as one man through one organization. Only by combining together and ceasing to compete one with another can British makers hope to oust the Germans and compel them not to produce more nitrogen than they require themselves until the world is ready to consume greater quantities. Only by unanimity will British manufacturers become arbiters of the sulphate of ammonia market.

Danger not from Germany Alone.

There are some who think the result of the war will so profoundly alter the position of Germany that it is a matter of indifference to British manufacturers whether the Germans put their Bill into operation or not. We say, in reply to them, that even if Germany ceased to exist altogether, the need for co-operation among British producers would not be any the less great nor the advantages any the less appreciable.

The production of nitrogen by synthesis has passed the experimental stage, and to-day large quantities of synthetic sulphate of ammonia, synthetic cyanamide, and synthetic nitrate of lime are being offered for sale. Synthetic sulphate of ammonia can now be produced anywhere and everywhere.

Now, the production of nitrogen as a bye-product cannot be limited as such; so that the only way to prevent over-production is to limit the supply of nitrogen produced as a primary product. Such a limitation can only be arrived at through a series of agreements made between the different nitrogen groups. It is clear that the best organized, most representative, and therefore most powerful, groups will be able to make the best bargains; and unless British producers of sulphate of ammonia form such a group when the time comes, their interests will go undefended.

Why not "Wait and See"?

It is sometimes objected that there is no need to trouble about these somewhat nebulous problems and difficulties of the future, until their solution is necessary; it is pointed out that sulphate of ammonia is now selling at about £15 per ton; that there has never been any difficulty in selling the salt; that British producers always have sold individually; and that, therefore, there is no need for any manufacturer to join an Association, which merely offers him superfluous assistance in selling what he has always sold before himself.

Now is the Time to Combine.

The answer to this objection is twofold: Firstly, that time and experience are required in order to accustom 500 to 600 individuals to work together, so that if we wait till the problems have to be faced, it will be too late; and, secondly, that while we are perfectly willing to admit that it may always be possible to sell sulphate of ammonia in the same manner as hitherto, we deny that individual salesmanship, however good, can ever hope to control the gigantic forces of supply and demand which rule the market. In other words, a good salesman who is well informed and has his fair share of luck, may obtain a slightly better average price over a number of years than a bad salesman; but this will always be within the limits of the general market prices, over which he has no control. But by combining with other individual sellers and selling through one organization, the manufacturer will gain the power to control the general level of price. When all manufacturers have joined the Sulphate of Ammonia Association, and entrusted their salt to the Association to sell, the British producer will appear in the world's markets as one seller of 400,000 tons, instead of 200 to 400 different sellers of 2000 to 1000 tons each. It is obvious that the weight he will carry will be infinitely greater than it is now.

Join the Association.

We therefore earnestly appeal to all manufacturers to join the Association and to entrust their sulphate of ammonia to the "Selling Branch" to sell.

The Work of the Selling Branch.

The "Selling Branch" commenced operations towards the end of September, 1914, at a time when the market was greatly disorganized owing to circumstances connected with the outbreak of the European War. The price for spot delivery at that time was about £10 10s. per ton.

The Rise in Prices.

The knowledge that a body of manufacturers, representing over two-thirds of the sulphate of ammonia annually exported from the United Kingdom, was prepared to adopt a common policy as regards prices, immediately had a strengthening effect on the market. Prices advanced steadily during the next few months, until in the spring £14 5s. to £14 7s. 6d. per ton was obtained. Given the market conditions prevailing, the shortage in production, and the fact that the United Kingdom was the only seller for export, a rise in price would no doubt have occurred in any case. But we maintain that the information which the "Selling Branch" was able to give to its members, put manufacturers in a better position than heretofore to form an opinion as to the future, and resulted in a higher level of price being maintained than would have been possible had the branch not been in existence.

In this respect the "Selling Branch" has adequately fulfilled the hopes of its founders; and, as experience and confidence are gained, we shall be able to extend the scope of our activities to a considerable extent.

It has been necessary to proceed cautiously at the beginning of a venture which marks a new departure in the history of the British sulphate of ammonia trade; and we have therefore not objected to our members selling their own make, provided they adhere to our prices. At the same time, the services of the "Selling Branch" have been at the disposal of all members, and we have frequently been able to obtain considerably better prices for parcels at a given port, owing to our knowledge that higher values were ruling at other ports. In this way, the value of a "Central Sales Office" has been demonstrated over and over again.

Association as Representative of the Whole Trade.

Owing to the many difficulties which have arisen in connection with the war, the need for a body representing the whole trade has been especially felt. The knowledge of foreign markets at the disposal of the "Selling Branch" of the Association enabled that branch to state the case for sulphate of ammonia in an authoritative manner, when exporters were faced with the possibility of having to wait several weeks for export licences. The opinion of a purely propagandist body could not have carried such weight with the Government. At the suggestion of the "Selling Branch," the authorities have adopted procedure which enables them to issue licences within a few days from the date of application. The result of this timely and successful intervention of the Association has undoubtedly saved manufacturers many thousands of pounds; for if there had been longer delays in obtaining licences, business would have been greatly restricted, and the present level of price could not have been maintained.

The "Selling Branch," then, has made a successful *début* both as a central source of information and as an organization fully qualified to represent the interests of manufacturers of sulphate of ammonia. Since the autumn of 1914, we have sold many tens of thousands of tons for our members through the usual channels, without difficulty and without disputes of any kind. In addition to this, we have been able to secure several special orders at prices which were very advantageous to our members.

At the present time several of our members have entrusted their entire production to us to be sold at our discretion. Others sell exclusively through us, stipulating that they shall be consulted as to the time of selling. The remainder continue to sell themselves, but usually consult us before doing so. Lists of minimum prices are issued at short intervals to serve as a guide to value for different periods.

In order that complete success may crown our efforts, it is essential that all our members shall not only sell exclusively through the "Selling Branch," but also that they should agree only to sell when the Selling Committee advises them to do so. We feel confident that we shall shortly be in a position to state that this is the case; and we shall then be able to adopt a stronger and more definite market policy than we have been able to do hitherto.

We shall then also be able to propound a scheme for giving all our members an equal share in the prices obtained. At present it very often happens that, owing to the fact that some manufacturers have sold for forward delivery, other makers, selling from hand to mouth, obtain better prices than those who originally supported the market. It will be the object of the "Selling Branch" to rectify these inequalities.

In concluding this brief review of the commencement of our work, we wish to draw special attention to our efforts to get British manufacturers generally to improve the quality of their make.

We think we may justly claim that our pamphlets entitled "Quality," and "Does it Pay to Make 25 per Cent. Ammonia," have, for the first time, clearly explained to makers why an improvement in quality is necessary. We have evidence that the views we have put forward are recognized as sound; and we feel convinced that in the very near future the bulk of the British production will be fully equal to the best sulphate of ammonia produced in the world.

We have on our staff an expert in sulphate of ammonia making whose services are at the disposal of our members. No charge is made for these services; and we cordially invite members to avail themselves of our expert's advice.

Work of the "Propaganda Branch."

Overseas Propaganda.

During the last few years we have extended our propaganda activities in favour of sulphate of ammonia to Switzerland, Denmark, Sweden, Holland, and Italy. Work has also been started in Egypt; and the results promise so well that we are making permanent arrangements in regard to that country which will form a very important outlet in the future. We have also examined the conditions in South Africa and India; and while the results hitherto obtained have not been very encouraging, we think that they warrant further investigation, and are making arrangements accordingly.

We are at present making inquiries in Australia with a view to opening a "Propaganda Office" in that country. In Spain, our work is progressing steadily; and sulphate of ammonia is being introduced into districts in which its use has hitherto been unknown.

Further Efforts at Home.

While we are thus paying due attention to the development of the trade in the expanding Colonial and Foreign markets, there is abundance of evidence that a far wider use of our product for agricultural purposes could be fostered in our own country; and our efforts are accordingly being conducted with increased energy to this end.

Sulphate of ammonia is peculiarly suitable as a nitrogenous fertilizer in our humid climate; and we are laying emphasis on this fact with a view—firstly, to displacing our competitors—nitrate of soda and nitrolim; and, secondly, to creating a new area of consumption.

In 1912 the quantities of sulphate of ammonia used per acre of cultivated land were in the following proportions:

Belgium.		Germany.		United Kingdom.
17·83	..	9·88	..	5·35

So it is obvious that there is room for a very considerable increase of consumption here. In order to attain this object, constant advertisements, constant experiments, and constant demonstrations are required, for the wheel of agricultural progress moves slowly, and there are many farmers to whom the value of sulphate of ammonia is still unknown.

We are, therefore, continually drawing farmers' attention to both the absolute and relative values of our salt—laying special emphasis on the fact that sulphate of ammonia has for some time been very much cheaper, unit for unit, than nitrate of soda.

Some idea of our work at home may be gathered from the fact that we have, during the last five years, distributed upwards of 750,000 copies of various pamphlets, leaflets, and reports. In addition to these, we have laid down a large number of experimental plots: 672 in 1910, 2724 in 1912, and 3045 in 1914. Experiments were made with sulphate of ammonia on all kinds of cereals, roots, potatoes, vegetables, and fruits; and on the whole the results obtained are very encouraging. During the last five years we have offered prizes amounting to £1800, in 380 farmers' competitions, carried out by Agricultural Societies. In order to make our work more effective, we have established a separate office in Scotland, and its activities have been attended with conspicuous success. We may also state that the tonnage contributing to our Association has increased, during the five years, from 210,000 to 304,000 tons—an increase of nearly 50 per cent.; and our membership now represents over 70 per cent. of the total make of sulphate of ammonia in the United Kingdom. We are renewing our efforts, both by means of letters and by personal visits, to induce all non-subscribers to join us and contribute towards the work of propaganda which is now of more vital interest to the trade than ever before, in view of the enormous increase in the German production of sulphate of ammonia.

Fresh Lines of Inquiry.

We are at the present moment investigating a number of problems, the successful solution of which would tend to promote a more extensive use of sulphate of ammonia. Among them we may mention: The liability to lodge exhibited by cereals after applications of sulphate of ammonia as compared with other nitrogenous fertilizers; the comparative malting quality of barley; the comparative production of foliage in root crops; the economy in loss of nitrogen through drainage; and the comparative amount of nitrogenous residuum which becomes available for the succeeding crop in rotation.

We find there is a tendency among farmers to regard sulphate of ammonia as similar to nitrate of soda in respect of its solubility. This leads them to apply it too late in the season, and to disregard the varying retentive quality of soils. We are, therefore, at the present moment making experiments with a view to showing:

1. That sulphate of ammonia may be profitably applied to wheat on retentive soils in the autumn.
2. The latest date by which application of sulphate of ammonia can be economically made on various soils and crops.
3. Whether it is advisable to plough-in the dressing in order to promote more rapid nitrification.

Commercial Side.

The above are a few of the never-failing supply of problems remaining to be solved by the scientific propagandist. It is obvious that if the value of the early autumnal application of sulphate of ammonia can be demonstrated, this will open up an entirely new market for the salt at home; for hitherto sulphate of ammonia has been applied most exclusively in the spring.

We are making every possible effort to induce corn factors and manure merchants to push the sale of sulphate of ammonia; and we would urge our members to be prepared to sell freely to merchants, in order that there may be an increased number of depôts throughout the country from which farmers can readily obtain supplies.

In order to minimize market fluctuations as far as possible, we have put forward a scheme with the object of inducing producers in various districts throughout the country to agree to sell at the same price for home use and to maintain the agreed price for one month after it is fixed. Prices to be fixed in each district by producers themselves.

FREIBURG CORPORATION GAS UNDERTAKING.

Report for 1914.

Freiburg, in the Black Forest, appears to be the first town of large or moderate size in Germany to publish the report of its gas undertaking for last year. [Many German towns have only just issued the reports for 1913.] In Freiburg, the output of gas up to the outbreak of war showed an increase of 5½ per cent. on the output for the corresponding period of 1913; but in the last five months of the year there was a decrease of about 3½ per cent. The result for the year's working was a gas production of 8,185,440 cubic metres [about 289,077,000 cubic feet], which represents an increase of 1·99 per cent. Of the gas made, 65·37 per cent. was sold for heating and power purposes; 21·08 per cent. for private lighting; 8·99 per cent. for public lighting; 0·20 per cent. for charging balloons; 1·09 per cent. for use on works; while 3·27 per cent. was unaccounted for.

The distinction between gas sold for heating and lighting purposes will have ceased as from Jan. 1 last, when a uniform price of 15 pf. per cubic metre [4s. 3d. per 1000 cubic feet] was introduced, in order to facilitate the substitution of gas lighting for oil lighting, in view of the scarcity of petroleum.

The war has caused many difficulties in working—some due primarily to inferior coal being supplied, and others to untrained labour having been substituted for regular hands who had been called to the colours. There were, however, no serious breakdowns or interruptions in the supply of gas; and the make per ton of coal averaged for the year very nearly the same as in 1913.

Tramore (co. Waterford) Gas-Works.—Mr. W. Gallwey, D.L., presiding at a meeting of the Tramore Public Health Committee, submitted the balance-sheet for the past year in connection with the gas-works. Receipts totalled £1160; while the expenditure amounted to £1305. The consumers numbered 219. The gas produced was 10,000 cubic feet per ton of coal; and the total production was 4,861,000 feet. The statement was considered satisfactory.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Proprietors was held last Wednesday at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Mr. Charles Carpenter, D.Sc., M.Inst.C.E., in the chair.

The Secretary (Mr. F. M'Leod) read the advertisement convening the meeting, and the minutes of the last ordinary general meeting.

The seal of the Company having been affixed to the "Register of Proprietors," the report and accounts [which have already appeared in the "Journal"] were taken as read.

Chairman's Address.

The Chairman: Ladies and gentlemen, I think it will perhaps be most convenient if I deal first with the least satisfactory aspects of the past half-year's accounts These are the heavy costs for the purchase and delivery of coal to the Company's stations, and the considerable extent to which we have had to borrow from our bankers, as shown under the item "Temporary Loans." I do not include in the same category the fact that the dividend for the half year will be at the rate of £4 8s. per cent. per annum, instead of £5 9s. 4d., which was the figure twelve months ago. Having regard to the terrible trial through which the country is passing, although as shareholders disappointment must be felt by us at the reduction, yet I think even this position is not so unsatisfactory from the patriotic standpoint as though we were making large profits out of the fact that the country is plunged in a terrible war, and is fighting for its very existence. We have had a good many years of regular working, with fairly constant dividends; and I do not think it could be expected that any industrial concern should have prepared itself for the great contingencies which have arisen during the last twelve months.

A SPELL OF DEAR COAL.

Our primary difficulty has been with regard to the purchase and supply of coal, the cost of which shows no sign of receding from the high figure to which it rose as a result of the coal strike of 1912. Prior to this, our expectations, based upon many years' experience, were that coal could on the whole be purchased at a reasonable figure, and that if, owing to exceptional circumstances, the price for any twelve months rose above the average, it quickly reverted to its former level. We are now suffering from the fact that we have had three and a half years, straight off, with dear coal, and there is little or no sign of an improvement.

PRICE REGULATION.

The application of the sliding-scale to gas undertakings took place, as many of you are aware, some forty years ago. Parliament was moved to action in the matter because some of the companies supplying the Metropolis with gas at that time, being faced with the question of the high cost of coal, promptly put up the price of gas, not only to meet this, but in order to continue the payment to their shareholders of undiminished dividends. The sliding-scale, as you are aware, is so arranged that gas companies have ever since that time had a direct incentive to keep their charge for gas as low as possible, since it is only by maintaining the low price that the usual dividends can be paid. If, owing to special circumstances, coal goes up and gas thereby costs more, the effect is shared by gas shareholders as well as by the gas consumers. I need not remind you that by the co-partnership we have had in recent years added the gas employee also. Now if these principles are right in their application to gas companies—and that they are right I think is pretty generally admitted—it does not seem illogical that coal, the raw material required for the production of gas, should be similarly treated. Parliament, it would seem, has at last realized the urgency of the matter, and a limit has now been fixed to the price to be paid for coal purchased after a certain date.

EXPORT OF COAL.

I may here tell you of our usual procedure with regard to the purchase of coal. We cannot, of course, become speculators in this article. Our practice is, and has been for many years, to go into the market in the early spring and to arrange our contracts for the ensuing twelve months. The collieries who are in the habit of supplying gas coals to us, and from whom we annually buy for large sums of money, are fully aware that this is the course we follow. Our great anxiety in settling the contracts this year, however, was not the price to be paid for the coal, but the fact that nearly everybody offered us less than had been their custom in previous years. Their explanation was that the output was largely reduced owing to enlistment, and what coal they had to spare must be shared among regular customers. If the regular customers had been entirely British, one would not have had serious complaint to make about such an arrangement. But when it is remembered that the Continent takes a large share of our coal, and that material which we were urgently wanting was going abroad—whether to neutrals or not does not matter—I think you will agree with me that it was high time the Government interfered. In fact, I do not see how any change could be made except by Government action. Take, for instance, a colliery that was in the habit of supplying one-third of its output to Great Britain and two-thirds to the Continent. It would be too much to expect it to run the risk of offending its Continental customers by going on supplying British ones to their detriment. The action of the Government in restricting export is having the desired effect. We are now filling up our stores at a rate that would have been absolutely impossible unless drastic restrictions had been enforced, even despite the fact that we did not let prices stand in the way of our purchasing.

FREIGHT CHARGES.—PURCHASE OF SHIPS.

With regard to the freight question, we are, as the report informs you, getting over this trouble by providing our own steamers. It may be asked, "Why did you not do this before?" Well, we certainly considered the matter, and were waiting a favourable opportunity. But we shall certainly not make a mistake in future by relying upon others to carry our coal. I am bound in justice to say that the prior arrangements were not unsatisfactory ones. Taking the average of several years, we chartered at a fair figure, which apparently did not show a very great margin of profit.

THE TEMPORARY LOAN.

The other item which, but for some explanation, might call for adverse comment, is as to the amount of the temporary loan, £360,000. In normal circumstances, we should have sufficient floating capital—by floating I mean, of course, other than invested in buildings and plant, &c.—to enable us to carry on our business with comparatively small recourse to our bankers. But high prices and the war have hit us severely in this respect. We formerly bought coal on a schedule of deliveries which had some regard to the variation in our consumption—that is, we took heavy supplies in the winter and small ones in the summer. This suited us, because we had less gas consumed in the summer months, and therefore were provided with less money to pay for the coal we purchased. We have now had to give up this policy, as we have found it necessary to fill up our storage accommodation to the fullest possible extent during the summer. Our coal stores have proved inadequate; and we now store coal on the open ground. We have taken in the football ground; and we are filling it up with coal. When the war is over, the ground will revert to its former use; but at present it makes a very convenient receptacle for coal. This means that more money is required to lie idle in the form of coal stocks; and the difficulty is accentuated by the high cost we have to incur for its purchase and transport.

RESIDUALS.

The war has also considerably interfered with our trade in residuals, in some of which we have had to carry considerable stocks. Our stock of coke, for instance, which in the ordinary way is exported and paid for, is now lying on our hands waiting for next winter's requirements, since the Government have restricted its export. I do not quarrel with this restriction; but it means that we have in coke and other residuals a good deal of money. Another matter which has arisen out of the war, which would not have happened at ordinary times, is this. We were exporting a bye-product to America, and we had 20,000 tons on a ship that was torpedoed not far from Land's End. We had to go without the money for this for some months, until the insurance was paid. I could give you other examples of the change which has come over our business, mainly due to the altered conditions we have to meet.

ISSUE OF STOCK TO CONSUMERS AND EMPLOYEES.

In common with other companies, we have for many years made it a practice to rely upon our bankers for their assistance in meeting difficulties created in this manner, since they have usually been found to be temporary; and it was not considered good policy to raise capital, which bears a permanent charge, for requirements which happen infrequently. It appears desirable, however, that we should issue further capital, as the difficulties to which I have referred appear to be becoming more common, and it is stated farther on in the report that we are, in accordance with our Act of Parliament, offering stock to the Company's employees and gas consumers. I am afraid the loan figure will be considerably higher by next winter; but we have every reason to expect it to be down to a more normal figure before I have the honour of again addressing you in February next. There appear to be several complications in the matter of the capital issue which have only been brought to light as a result of our present difficulties, and the Board have under consideration the question of a Bill to be promoted in the next session for regularizing these matters.

RESTRICTED PROFITS ON RESIDUALS.

Before leaving the subject of the high cost of coal, I ought to add a word with regard to residual products because it has been stated somewhat fully lately that there should be more restrictions placed upon gas companies as to the amount of profit they should be allowed to make in respect of these. The answer that should satisfy everyone is, of course, that, as a result of the half-year's working, we have to be content to take a very considerably reduced dividend. With regard to coke, our practice is to charge for this a price which, taking all the circumstances of our coal purchases into consideration, may be regarded as a fair one. We have, as far as possible, endeavoured to apply the price pertaining to the sale of gas to that of coke. It would be manifestly unjust to put up the price for gas because on a cold day everybody wanted it for warming purposes. We have endeavoured to deal with coke in the same manner, and not raise the price when the snow is on the ground and the demand is at its highest. There are two other products of distillation now urgently required by the Government—viz., benzol and toluol, used in the manufacture of high explosives—and to whom practically the whole of our production is being sold. Now I can say from my own personal knowledge that whatever may be the case with regard to intermediaries or agents, the gas companies are certainly not making unfair profits out of these productions. In fact, the price we are getting for both of these important constituents of coal tar were actually fixed by a Government Committee who had the advantage of having before them the prices realized for both these materials for many years past. I happen to know that they had the figures before them, as I furnished the Committee with the data.

LIGHTING REGULATIONS AND DECREASED CONSUMPTION.

The report tells you we have had a decrease in our gas consumption of nearly 3¾ per cent. This we can trace solely to the lighting regulations put in force to diminish the amount of light in our various thoroughfares. Had it not been for these, there is every reason to believe that, despite the additional charge we found it necessary to impose, we should have had an increase, instead of a decrease, in our business.

FEMALE ASSISTANTS.

The last paragraph but one of the report refers to the employment of female assistants. Six months ago, we told you that 32 per cent. of the staff were serving with His Majesty's Forces. We endeavoured to get along without them, but at last found it necessary to arrange for the employment of substitutes; and it seemed the proper thing to look upon female labour as the best available in the circumstances. I might here say that we laid down the rule at the beginning of the war that no fresh employment was to be given to anyone except he was disqualified from the military point of view. The question arose as to what we would pay for the supplemental labour. The conclusion to which we came—and I think the right one—was that we should pay on the same basis as previously. These principles we have adopted; and the commencing rates of wages are the same with the women as with the men. What they rise to will depend upon the amount of work turned out. The reports I continue to hear with regard to the employment of women in our show-rooms and the district are in every way encouraging.

CO-PARTNERSHIP.

I must add a final word with regard to our co-partnership. In earlier and happier days it was said to us, "Your co-partnership is all very well while your bonus is high, but what will happen when it goes down?" Well, it has very seriously gone down now. Our employees are sharing with the shareholders the loss of profits, just as the consumers are sharing in having to pay a higher price for their gas. But all of them have cheerfully responded to the demands made, and although, owing to the pressure of some of the work upon which we are engaged we have had to work early and late, I am pleased to say that the service has been in every case willingly given. The cheerful spirit animating our workpeople which was so apparent in times of peace has more than ever proved its value in times which, like the present, are putting the nation through a terrible test.

I beg to move—"That the report and accounts now presented be received and adopted, and the report entered on the minutes."

The Deputy-Chairman (Mr. Kenneth F. Hawksley): I have much pleasure in seconding the resolution. After the full explanation given by the Chairman as to the principal items in the accounts, it is not necessary for me to go into them.

The Chairman: If any shareholder has any questions to ask, we shall be glad to do our best to answer them.

Shareholders' Criticisms.

Mr. Havelock West said he had looked carefully through the balance-sheet. No doubt, the Directors had had very considerable difficulties to contend with, owing to freightage having gone up from 3s. to 15s. a ton. With regard to the fifth paragraph of the report, which stated that, "in order to provide for the extending requirements of the business, stock to the amount of £100,000 is being offered to the Company's employees and the gas consumers," when he got his notice of the meeting, with the balance-sheet, an application form was not enclosed, and he thought shareholders had a preferential claim over consumers. He bought his shares at 120; and now the Directors were proposing to issue stock to consumers at 82. On calling at the Company's office, he was catechized as to whether he was a consumer; and on stating that he was a consumer, as well as a shareholder, he got an application form. One other remark. As this was the quinquennial year, he should like to know whether the Company ought not to get a considerable reduction of assessments.

The Chairman: Dealing with the question with regard to not letting the shareholders have notice of the issue of the new stock, I mentioned in my speech the fact that we found there were certain inconsistencies in our Act of Parliament which we want to put straight. One of them is, that we are precluded from offering the shareholders any of our stock below par. We were so concerned about the matter that we took the opinion of one of the greatest lawyers in the land; and he confirmed our view of the matter. Our shareholders would no doubt like to level-up their holdings by buying stock at the present low figure; and so equalize the high sum they paid in the past. But we could not go against the specific terms of reference in the Act of Parliament which regulates our business. That, I think, is an unanswerable reply.

A Shareholder: Do I understand that you could not issue the stock to the shareholders at par?

The Chairman: It could be offered at par. The restriction is that we must not offer any stock below par except to employees and consumers. With regard to the quinquennial valuation, of course, we are entitled to very considerable reductions in our assessment. I attended a meeting last week of one of the most important Committees who have to deal with rating; and it is perfectly clear the members were alive to the fact that they would have to effect a very considerable reduction in our rateable value. Another question has been handed up to me, with regard to the rate of dividend. I am not sure whether it is possible to rectify this; but the clause of the Act which governs our dividend says that if during any half year the price of gas is so and so the dividend shall be so and so. It does not say the "average price" of the gas is to be taken into consideration. The great increase in the price of gas was not made until the end of the March quarter; so that, unfortunately, the rise of price affects the dividend for the two quarters. The spirit of the regulation should be that the "average price" should be the governing factor of the dividend. The Act says, if in any half year the price of gas is raised, the dividend is to go down; and we are bound by that. It is certainly illogical and not just. Whether we can get it altered in the Bill which is under our consideration, I do not know; but I certainly think that it ought to be.

The motion was put and carried unanimously.

Dividend Resolution.

The Chairman: I have to move—"That a dividend at the rate of four pounds eight shillings per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post."

Mr. John Mews: I usually, in seconding this resolution, feel great pleasure in doing so; but to-day the pleasure is a somewhat mixed one, because this is the smallest dividend that has been distributed to you since I joined the Board. In the absence of my friend Mr. Ewart, I am the senior member of the Board to-day. At the present price of our stock—viz., 83—the return is rather more than 5 per cent.; and no doubt you will say, "Why is this?" The whole financial affairs of the country have been upset by the new War Loan, of which you have heard so much. If the Government offers stock which returns to the holder 4½ per cent., it is manifest that shares in industrial undertakings must come down in value, as the Government have set a perfectly different standard to what was in vogue before. There is one shade of blessing in the matter, which is that we have earned our dividend. I know, and I daresay you do, a good many companies that have passed their dividends altogether. We are selling something which is absolutely essential to the well-being of the country.

The resolution was unanimously carried.

The CHAIRMAN: That concludes the business of the meeting.

VOTES OF THANKS.

Mr. W. R. LEE, a shareholder, said he felt sure it would be the wish of the meeting not to separate without someone proposing a hearty vote of thanks to Mr. Carpenter and the Directors. They must all realize that the Board had passed through a very anxious and trying time; but he could assure the Board that they had the confidence of the proprietors, and he trusted when they next met the Chairman would be able to present the "better report" which he had foreshadowed that day. He had much pleasure in proposing a hearty vote of thanks to the Chairman and the Directors for their able management of the Company's affairs.

Mr. R. L. ANDREWS seconded the motion. As a fairly large shareholder, he looked on the South Metropolitan Company as the premier Company for the supply of gas, as it gave the working classes gas at a low price.

The resolution was carried unanimously.

The CHAIRMAN: Ladies and gentlemen, I can assure you, on my own behalf, and on behalf of my colleagues, that we are very grateful for this vote of thanks. If times have been trying to us, how much more trying have they been to the staff; and therefore I would propose a vote of thanks to them. I regret that our Chief Engineer, Mr. Doig Gibb—one of the kindest and most pleasant men one could meet—has so broken down in health that he has asked to be relieved of his position. A position of such responsibility in an undertaking like ours is no sinecure; and it is with great sorrow and regret I have to tell you that Mr. Gibb's strength has proved unequal to the strain. I am sure you will allow me to propose a hearty vote of thanks to the staff for their valuable services.

Mr. C. P. CROOKENDEN, in seconding the motion, said he was sure nothing could have been more trying to the Board than having to put up the price of gas.

The resolution passed unanimously.

The SECRETARY, in acknowledging the vote, said he was sure that the appreciative remarks of the Chairman—endorsed as they had been by the meeting—would encourage the staff of all grades in the Company's service to still further efforts. They had 2000 of their colleagues away fighting the country's battles; but those who remained behind were doing their utmost to keep things going, and he was sure they would continue to do so. On behalf of all concerned, he thanked them for their kind vote.

ALDERSHOT GAS, WATER, AND LIGHTING COMPANY.

The report adopted at the half-yearly meeting of the Company last Friday week stated that the total revenue during the six months to June 30 was £51,456, and the expenditure £39,785, leaving a surplus of £11,671. After providing for dividends on the consolidated preference stock, and interest on special loan and debentures, the Directors recommended the full statutory dividends of £5 18s. per cent. per annum on the "A" stock, £4 8s. per cent. per annum on the "B" stock, and 5 per cent. per annum on the "C" consolidated stock for the half year—all less income-tax. The sale of gas for all purposes had increased nearly 27 per cent. (26 89 per cent.) and the sale of water had also advanced. The output of electricity exceeded 12,000 units for the first half-year's working; and the future of this department promised to be successful. Residuals had been better; but the extra price for coal neutralized any benefit. The prospects for coal, oil, and other commodities used in the Company's various undertakings did not appear too rosy. Much work was in hand and being arranged for to meet the general expansion of the different departments.

The CHAIRMAN (Mr. W. T. Robertson, J.P., C.C.) said it had only been necessary to increase the price of gas 4d. per 1000 cubic feet, which must be regarded as eminently satisfactory. This was reflected in the dividend; for under the sliding-scale, coupled with the co-partnership scheme, the consumers, stockholders, and employees were bound together by one common principle. It would be seen that the sale of gas had increased by 26 89 per cent. over the corresponding period of 1914, for which period the increase was 11·2 per cent. over 1913. To keep pace with increases of this character entailed a great deal of anxious thought and forecast, as well as a big expenditure of capital. The increased demand for water had also necessitated provision for additional equipment. As to the electricity branch, the result of the first half-year's working, though not showing a profit, had not been disappointing; for there was every indication that the department would at an early date pay its way.

The VICE-CHAIRMAN (Dr. F. Stroyan), in seconding the motion for the adoption of the report and accounts, said he thought they might all congratulate themselves on the working of the past half year.

The CHAIRMAN, replying to a vote of thanks to the Board and the staff, remarked that he desired personally to pay a warm and well-deserved compliment to the General Manager and his staff, for the admirable manner in which they had discharged their duties—incidentally alluding to the exceptionally trying difficulties with which they had had to contend. More especially difficult had been the position of Mr. Edwards in regard to the men who had left him.

The GENERAL MANAGER and SECRETARY (Mr. R. W. Edwards) said he would like to thank the members of his staff for their energy, support, and loyalty towards him. As a matter of fact, he could not find words to convey his full sense of appreciation of their loyalty and service, for they had done their very best. He also expressed satisfaction with the result of the half-year's working of the electric department.

SOUTH SUBURBAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Company was held on Friday last, at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Mr. CHARLES HUNT in the chair.

The SECRETARY (Mr. Wilfrid Wastell) read the notice convening the meeting; and the report of the Directors and the statement of accounts were taken as read.

COAL CRISIS EARLY IN THE YEAR, AND PRESENT POSITION.

The CHAIRMAN: It is my duty to move the adoption of the report and accounts; and, in doing so, I should like, with your permission, to give a brief account of our stewardship under the unique conditions created by the war. I may remind you that, when we had the pleasure of meeting you last February, the whole country was passing through a most serious crisis as regards coal supplies, which in our own case were reduced by about 40 per cent.; and but for recourse to carburetted water gas—which was not contemplated when arrangements were made for the year's supply of coal—the winter months could hardly have passed without mishap. This crisis culminated in a rapid advance of prices, reaching to a level much higher than had been known for fully forty years. It will be readily understood that the fixing of new contracts under these conditions was not an easy matter, especially as the advisability of varying somewhat our usual arrangements for delivery had also to be kept in view. In the result, our new coal is divided, although unequally, between sea borne and rail-borne; and of the latter a considerable proportion is for delivery during the summer months, when in ordinary times it is difficult, owing to slackness of demand, to keep the pits fully at work. In this way, some little has been done to increase colliery output at a time when this is greatly needed; while the accumulation before the winter of a larger stock than usual ought to make the position more secure should there be, unfortunately, any repetition of last winter's troubles. Coal continues, I am glad to say, to come forward freely; and the quantity already in stock is equal to expectations.

AUXILIARY SERVICE OF CARBURETTED WATER-GAS PLANT.

Arrangements have also been made by strengthening the plant to increase the production of carburetted water gas during the winter months, should this be found necessary. The Company, I may say, have never looked with very great favour upon this gas as an adjunct to coal gas, mainly for the reason that it generally pays better to make all coal gas. On occasions, however, it can be of very great service, as it was for example during the national coal strike a few years ago, and more recently when the disposal of coke in any other way had become a matter of extreme difficulty. We turn to it now as to a friend in need; and the deliveries of oil, like those of coal, have so far been well maintained. Both coal and oil have, however, had to be paid for at such prices as could only be met by a substantial rise in the price of gas. I need not say with what reluctance the Directors came to the conclusion that a further rise of 5d. per 1000 cubic feet was inevitable, nor with what extreme pleasure we shall hail the return of more favourable conditions. I have referred first of all to the subject of supplies because of its exceptional importance at the present time, and also because it is reflected in the accounts, although not to the extent that it probably will be in the next and succeeding half years, when the full brunt of war prices will be experienced.

DEBENTURE STOCK AND INVESTMENTS.

Turning now to the accounts, attention may be directed in the first place to the appearance in the capital account of the whole of the debenture stock under one denomination—the 4 per cent. and the 3½ per cent. stocks having been converted into 5 per cent. stock, in conformity with the Company's Act obtained last year. In the next place, it will be seen that there is an appreciable improvement in the financial position; the Bank debt having been reduced during the half year from £65,000 to £25,000. This reduction of £40,000, even though it may not be fully maintained in face of the higher prices now being paid for raw materials, cannot but be of special importance just now, when there is a good deal of uncertainty as to the position of the Money Market in the near future, and while also realization of securities continues to be out of the question. Some advantage in this respect, and also in securing a better return for the investment, might have attended the conversion of the Company's somewhat large holding in Consols into War Loan Stock; but this, after full consideration, was not found to be practicable under present conditions. It will be readily understood that there has been a further depreciation of this holding; and although this is of little consequence so long as it is not necessary to realize, seeing that the income remains the same, it may perhaps be desirable in future half years to show the reserve and special purposes funds in amounts more nearly representing their present capital value; and this will probably be done.

REVENUE OF THE HALF YEAR.

On the credit side of the revenue account, the sales of gas show an increase of £15,875, which is wholly due to increase of price; the consumption having remained practically stationary, although, but for the reduction of public lighting, it would have shown an increase of about 1 per cent. A slight falling off in rents for fittings, &c., is due to the remission of rent charges for outside shop lamps during the discontinuance of this lighting—a concession which has been much appreciated. In the receipts for residuals, there is a marked improvement, notwithstanding a reduction in the quantity produced owing to the manufacture of a proportion of carburetted water gas. From this cause the receipts for tar, with only a slight falling off in prices, have fallen £1607; while, on the other hand, improved prices have more than compensated for a corresponding fall in the production of sulphate of ammonia, the receipts for which have exceeded those for the corresponding half year by £312. The net increase, therefore, for residual products (£7601) is wholly due to the great recovery which has taken place in the demand for coke—a recovery made doubly welcome by the extreme depression which was experienced throughout the whole of the previous half year. This improvement, so far from showing any abatement, has been accentuated during the summer months when production is at its lowest, and its continuance cannot but assist towards a return to lower prices for gas. In the total receipts, there is an increase of, in round figures, £23,000.

THE METER-RENTS QUESTION.

Before leaving this side of the account, I should like to say a word or two on the subject of our recent proposal to equalize the charge for meter-hire throughout the whole of the Company's present area of supply. Since the amalgamation in 1912, there have existed three separate rates for meter-hire—viz., the two sliding-scale rates of the Bromley and Crays and the West Kent Companies, under which the charge varies according to the size of the meter, and the original Crystal Palace district flat-rate of 3s. per annum, irrespective of size. Unfortunately the latter, whatever may have been at one time the case, is now insufficient to represent the service rendered by the Company to the consumer in lieu of the exercise by him of his statutory right to supply his own meter. Otherwise its extension to the new districts could only have been a matter of time, because I must tell you that, having had the unique opportunity of observing the working, side by side, of these two systems of charging, we have come to the conclusion that the flat-rate—illogical though it may appear, and perhaps is—has, as compared with the system under which a consumer has to pay anything from a few shillings to as many pounds per annum according to the value and size of his meter, a practical advantage which could not in the interests of the undertaking be ignored. Under a sliding-scale, the consumer is apt to question the recommendation of the Company to change to a larger meter involving an increased annual cost, and to continue from motives of economy the use of one of insufficient size for his requirements, to his own inconvenience and the Company's loss. Whereas, with a flat-rate, the size of his meter is a matter of indifference to him; and it is the Company's own fault should there be any shortage of supply through the use of too small a meter. Nor is it in our eyes a demerit of this system of charging that it gives, automatically, an advantage to the large consumer. We have accordingly changed to a flat-rate in the Bromley and West Kent areas—adopting for the purpose the 6s. rate hitherto charged in those areas for a 5-light meter; and, in proposing that this rate should also apply to consumers in the Crystal Palace district, who are using meters of corresponding sizes—namely, 5-light and upwards—it did not appear to us that we were asking anything unreasonable. That this view was largely shared by consumers is evident from the great number of them who agreed to pay the extra 3s. which the change involved. Others, however, objected; and with the desire to maintain the excellent terms on which the Company have always been with all the consumers, it was decided to withdraw the proposed additional charge.

REVENUE EXPENDITURE.

On the other side of the account, the cost of coal, oil, &c., is the highest on record, although helped by the working out of last year's lower priced contracts. Altogether, including an exceptionally heavy amount for repairs, the cost of manufacture shows an increase of £18,073, to which has to be added the new item appearing lower down of £2605 for war bonus and allowances. Against these increases, there is a fairly substantial reduction in the cost of distribution; but this is not altogether a matter for congratulation, because it represents a slackening of the pace at which development has recently been proceeding. This slackening was bound to come sooner or later, with the filling-up of the new districts; but it now occurs concurrently with a falling-off in the demand for heating appliances attributable to the war. In reality, however, our progress in this respect, as also in regard to new consumers, continues to be satisfactory, and suffers only in comparison with the exceptional activity of the last two or three years. No fewer than 851 consumers were added during the half year, as stated in the report, while 1643 additional gas-stoves, &c., were fixed during the same period.

THE BALANCE AND THE DIVIDEND.

The result of the half-year's trading is a credit balance of £41,247, as compared with one of £32,235 for the corresponding half of last year; and, after providing for all interest and other charges, and restoring to the special purposes fund the amount taken from it last half year—viz., £2712—there remains a balance available for dividend of £32,862. As you are aware, the rate of dividend is entirely dependent upon the highest price charged for gas during the half year, rising or falling by 3s. 4d. per cent. for every penny charged either below or above the standard price of 2s. 9d. per 1000 cubic feet. The present price of 2s. 10d. in the Crystal Palace district—which is the highest charged by the Company in the district since 1901—being 1d. above the standard price, carries with it a dividend less by 3s. 4d. per cent. than the standard dividend of 5 per cent. This will absorb the sum of £27,789, and leave to be carried forward to next half year £5074, which, however, to the extent of £4082, is due to reduction of dividend. As compared with the former dividend of 6 per cent., the present dividend is less by £5782, which represents the full reduction per half year consequent upon the war.

REGULATION OF COAL PRICES—RATES OF FREIGHT.

For how long the present low rate of dividend may have to be continued, it would be useless to conjecture; but there can be no harm in saying that we are by no means despondent on the subject, although to what extent, if any, relief may come through the operation of the Price of Coal (Limitation) Act, cannot yet be ascertained. The Act, as you are all probably aware, was passed with the object of limiting the increase of pit-head prices during the continuance of the war, and for six months afterwards. This may have the effect of steadying prices, which would be an advantage, as enabling us to see where we stand. But the question of supply is just now one of paramount importance, and it is at all events conceivable that coalowners may avail themselves of the most advantageous outlets for their production, against which the further restriction of exports can only prove to be a partial remedy. At the present time, however, the chief concern of this Company is with excessive freight charges, which have been left untouched by the Government. It is happily true that, owing to various remedial causes, the cost of freightage is now only a little more than half what it was a few months ago; but even the present more moderate rates of 7s. to 7s. 6d. per ton represent an increase over pre-war rates of about 4d. per 1000 cubic feet, calculated on the quantity of gas sold per ton of coal carried. It is not suggested that the whole of this goes into the pockets of the shipowner, because it is well known that expenses have greatly increased. These, however, are shown by the experience of the Commercial Gas Company, as related at the recent half-yearly meeting by the Chairman, Mr. W. G. Bradshaw, to be covered by 1s. 4d. per ton, or less than one-third of the present extra charge—this being moderation itself as compared with what was charged only a few months ago, and may be again, for anything that is known to the contrary.

THE COMPANY'S WAR SERVICE.

With regard to the fifth paragraph of the report, the large number of employees who have now joined the Forces is causing some embarrassment owing to difficulty in finding temporary substitutes; and for some of the lighter kinds of work the employment of women, already successfully adopted by the South Metropolitan Company, is under consideration. Acknowledgment must, however, be made of the readiness with which those who remain have shared between them the work of their absent colleagues. This refers more particularly as a matter of course, because of the nature of their duties, to the members of the staff. Of those who have joined the Forces, four have unfortunately lost their lives, and eleven others have been wounded. In response to the letter and small gift which, at the suggestion of proprietors at the last general meeting, were sent to each employee serving with the Forces, many interesting letters have been received. [These were on the table for proprietors to look at.] In addition to the offers mentioned in the same paragraph—the offer of the Livesey Hall and Institute to the Royal Army Medical Service as a hospital, and the offer of a vacant piece of ground to the London County Council for the storage of coal for the coming winter, neither of which has yet been accepted—the Company have placed at the disposal of the Munitions Committee facilities for the manufacture of munitions, and have also taken part in the supply of additional tar products. With regard to the latter, it may be pointed out that one result of the war has been to bring into prominence the great importance of the gas industry as furnishing means for national defence; and, consequently, the necessity for encouraging rather than restraining, after the manner of what is known as the chemical clause, the activities of gas undertakers in developing the residuals side of their business. Recent events have shown that such development is of advantage to the State in times like the present; and for this reason alone, if for no other, it may be hoped that complete freedom in this respect is for the future assured.

CO-PARTNERS IN GOOD AND BAD YEARS.

Concurrently with reduction of dividend comes reduction of bonus to co-partners, which is the more to be regretted because of the assiduity and hearty co-operation of all ranks during this period of exceptional anxiety. Their share, however, of the burden imposed by the war is being cheerfully borne by them, and brings with it no weakening of faith in the system of co-partnership, the strength of which continues to be found in the community of interests and goodwill which it creates. None the less will there be on all sides great satisfaction when once more the tide turns, as turn it surely will, in the direction of larger bonuses. I have pleasure in moving "that the report and accounts, having been examined and signed by the Auditors, be received, adopted, and the report be entered on the minutes."

Mr. JOHN BORASTON said he had much pleasure in seconding the motion. It was customary for them to do this in a purely formal manner, as in view of the exhaustive and lucid statement they invariably had from the Chairman, further words were superfluous. At the same time, before sitting down, he should like to bear cordial testimony to the unflinching courage, skill, and foresight with which the Chairman had directed the affairs of the Company during the period of unexpected and wholly unparalleled difficulty. He thought they, as proprietors, had every reason to congratulate themselves upon the fact that, at this time of national stress, their interests lay in his strong and capable hands. [Hear, hear.]

The motion was unanimously carried.

The DEPUTY-CHAIRMAN (Sir Fortescue Flannery, Bart., M.P.) said that while naturally he had the greatest pleasure in moving the next resolution, he should have had much greater pleasure if he had had the duty of proposing larger figures. But there was no man in the room who did not understand, appreciate, and approve the co-ordination of the interests of all concerned. It was like the house that Jack built. The coalowner and the shipowner forced up the price of coal, the gas company had to pay more for their coal, up went the price of gas, and down went the rate of dividend to the proprietors and the rate of bonus of the employee co-partners. Everybody suffered from the extra cost of coal. The whole principle was right. The whole co-ordination was part of the system of co-partnership founded by Sir George Livesey, who, as he (Sir Fortescue) always believed, initiated a great reform in which would ultimately be found the solution of the difficulties of capital and labour. The dividend, the Directors hoped, was only reduced for a time. But there was one point in connection with the system, or rather in connection with the application of the Acts of Parliament to the system, which might possibly be amended; and this was that the change in the rate of dividend and bonus was based upon not the average price of gas during a half year, but upon the highest price of gas during that half year. It seemed to him that in future Acts of Parliament there might possibly be an improvement, by which the reduction of dividend would follow not upon the maximum price, but upon the average price at which gas was sold to the consumers during the half year. Broadly speaking, they were all more than satisfied with this system; and the privation of the proprietors in connection with it at this moment he believed was only temporary. The dividends he had to move should be declared were at the rates per annum of 5 per cent. on the preference stock and 4⅚ per cent. on the ordinary stock and on the West Kent ordinary stock, all of them less income-tax.

Mr. GEORGE ROSS (one of the Employee-Directors), in seconding the resolution, said he should like to thank the proprietors for the confidence placed in the co-partners. He was sure the co-partners were all delighted to do their duty under every circumstance, and especially under the present circumstances.

The motion was unanimously carried.

Mr. William Brown, J.P., in moving a vote of thanks to the Chairman and Directors, remarked that the country had been passing through a time of intense anxiety, which must have borne very considerably upon the Chairman and Directors and the officers of the Company. Notwithstanding, their affairs had been very successfully brought through the half year; and this gave them the very best basis for continued confidence in the management of the Company. From the Chairman's speech, and from what he regarded as under the circumstances a very good report, he believed that they might look forward to something better in the early future.

Mr. E. W. Drew, F.C.A., in seconding, said it must be within the knowledge of all the proprietors that the conditions under which gas undertakings had been working were in a very bad state; and therefore he thought the proprietors ought to be very satisfied that they had a Board of Directors in whom they could place implicit confidence. On the Board they had science, engineering ability, and business capacity strongly represented; and they ought to be very grateful indeed that they had a Board upon whom they could so thoroughly rely.

The motion was cordially passed.

The Chairman expressed, on behalf of his colleagues and himself, his thanks for the terms used by the proposer and seconder of the motion, and for the cordial ratification by the proprietors. It was true the Board had had an anxious time; and he did not suppose that the immediate future would be much less anxious. But the Directors were confident as to the future of the Company; and they hoped that they saw the promise of better things not far distant. He need hardly assure the proprietors that they would do their best to bring them about. He should now like to propose a very cordial vote of thanks to the officers, their staffs, and the employees generally for their exceptional services during the half year. Whatever attention a Board of Directors might give to an undertaking of this kind, they could do but little unless worthily seconded by the staff and employees generally. The Board had been so seconded; and it gave him much pleasure in asking the proprietors to make this recognition of their services.

Mr. John Randall, in seconding, said he was pleased to hear the Chairman say in his address that the little remembrances sent to their men at the front had been received by them with pleasure, and that acknowledgments had been made. But he ventured to make a suggestion in regard to this. It was not likely the war would be over this side of Christmas; and he would like to suggest that some little present be then sent to the men who were serving in the trenches, and not leave it until after the annual meeting in February.

The Chairman intimated that he felt sure it would give the Directors very great pleasure to accede to the suggestion that had been made.

The motion was heartily agreed to.

Mr. S. Y. Shoubridge, in replying, said he was sure it would give the workmen and the engineering staff very great pleasure when they read the kind words that had been used regarding their services, and heard the hearty manner in which they had been received by the proprietors. At an anxious and difficult time like this, it was exceedingly cheering and encouraging to those who were fighting the battle of the Company in (so to speak) the trenches, to feel that they were so strongly supported by powerful artillery behind them. On behalf of the engineering staff, the workmen, and himself, he thanked them all very heartily.

Mr. Wastell, on behalf of the secretarial staff and himself, also thanked the Directors and the proprietors for their expression of confidence and approval of the work of the staff. In the tremendous times through which they were passing, it was not easy to prevent the fog of war obstructing the clearness of vision. From conversations he had had with several members of the staff he was certain that, as far as the path of duty laid—duty both to the Company and the State—every member of the staff had a very clear vision as to where his steps should go, and would follow that path to the very end.

EASTBURY PUMPING-STATION OPENED.

New Works of the Colne Valley Water-Works Company.

In brilliant weather, and with a large attendance of Directors, officials, stockholders, and friends, the formal opening took place last Tuesday afternoon of a pumping-station which has lately been erected by the Colne Valley Water Company in Eastbury Road, Watford, about one-and-a-half miles from the Bushey works.

It may be stated that the Company was constituted under an Act of 1873, for the purpose of providing and maintaining water-works for the supply of Bushey, Pinner, Stanmore, Edgware, parts of Harrow-on-the Hill and Hendon, and other districts in Hertford and Middlesex. Of the promoters, Mr. Charles E. Keyser, J.P., D.L., the present Chairman, is the only one who is now associated with the Company; and his record, as is truly remarked in a souvenir pamphlet which was distributed among the guests, has been one of untiring energy and zeal in the interests of the concern. The powers of the original Act enabled the Company to construct pumping and softening works at Bushey, with a service reservoir at Bushey Heath, and the laying of the necessary mains for conveying water to the places to be supplied. The works were designed and carried out under the superintendence of the late Mr. J. F. La Trobe Bateman; the Contractors for the well, buildings, reservoirs, and pipe-laying being Messrs. Lucas and Aird, while the engines and boilers were supplied by Messrs. James Watt and Co. Under an Act of 1885, the Company acquired the undertaking of the Harrow Water Company; and the area of supply was extended, as it was again subsequently, in 1894.

Glancing first at the Bushey works, these now comprise four powerful "Woolf" compound condensing rotative beam-engines, each capable of dealing with approximately 2 million gallons of water per 24 hours, four large Lancashire boilers with superheaters, and softening reservoirs capable of treating 6 million gallons of water per day by Dr. Clark's lime process. The main service reservoirs, which are situated at Bushey Heath, have a top-water level 515 feet above Ordnance datum, with two standpipes and a high-service tank, from which the consumers in the Company's district of 76 square miles are supplied by gravitation. There are also subsidiary service reservoirs at Wembley and Shenley.

The works in connection with the Eastbury pumping-station, which were commenced in 1911, consist of two engine-houses and a boiler-house. The main engine-house is 80 feet long by 54 feet wide and 51 feet in height from basement to eaves; and it has been designed to receive three powerful beam-engines. The second engine-house is 45 feet long by 22 feet wide and 14 feet in height to the eaves; while the boiler-house is 53 feet long by 45 feet wide and 21 feet in height to the eaves. The engine which was named and started last Tuesday is a "Woolf" condensing rotative beam-engine supplied and erected by Messrs. Hathorn, Davey, and Co., of Leeds; and it is capable of raising and delivering 2 million gallons of water per 24 hours into the Bushey softening reservoirs. In the smaller house there is to be seen one of the Company's original engines—a horizontal non-condensing single cylinder engine constructed in 1874 by Messrs. James Watt and Co. This is being retained as an auxiliary engine. There are in the boiler-house two Lancashire boilers, each 30 feet in length and 7 ft. 6 in. diameter, fitted with Musgrave superheaters, supplied by Messrs. H. & T. Danks, of Dudley.

After the visitors had assembled around the door of the main engine-house, the Vice-Chairman of the Company (Mr. A. Helsham-Jones) remarked that in times past when the undertaking was started, the promoters certainly had before them a beneficent object; for at that period there was a great want of pure water in the neighbourhood. The aim of supplying this need was very quickly attained; but to the promoters it was not a very encouraging business just at first. For some years there was no return for their outlay, though there was a return for their efforts, as it was a good work. On behalf of the members of the Board, he asked the Chairman to formally open the buildings, and presented him with a gold key, with which to perform the ceremony, and as a memento of the occasion.

Mr. Charles E. Keyser, before using the key, explained that the engine they were about to see was the first of two which were actually in hand; and no doubt before long there would be three fine engines in the house. They would, of course, not require to be so large as those at the old station, because all they would have to do would be to raise the water from the earth and pass it on to the softening reservoirs at Bushey. As a matter of fact, the foundations for the second engine were already prepared; so that all round them were signs of the progress the Company were making. He then opened the door, and on entering the house was asked by Mr. Charles T. Part (a Director) to name the new engine "George V.," and to start it to work. Complying with this request, the Chairman remarked that the name of the second engine would be "Queen Mary." On the invitation of the Vice-Chairman, Mrs. Keyser next unveiled the entablature plate containing the names of the Directors and chief officials who had been associated with the enterprise. A vote of thanks was then heartily passed to the Chairman and Mrs. Keyser, on the proposition of Mr. F. E. Marshall, seconded by Mr. E. H. Loyd (Directors of the Company); it being remarked that the prosperity of the concern was in great measure due to the immense amount of work which the Chairman had for many years done for the undertaking. After singing the National Anthem, the company adjourned to a marquee for tea.

Here Mr. Keyser gave an interesting account of the early history of the Company, recalling many important and amusing episodes in connection with it. He pointed out that things did not run very smoothly during the period of the promotion of the Company. Great opposition, for one thing, was raised by those who had rights over the River Colne. There was also much excitement over the subject of the alleged danger of dealing with underground water; and many experts were called in to prove that mischief would be caused by the Company tapping the deep springs in the chalk. He maintained, however, that the continuous growth in the population of the district was to no small extent due to the excellent water supply which they enjoyed. For many years the shareholders received no dividend; and naturally the Directors would take no fees. But fortunately this state of things was in time entirely altered. In connection with their present happy condition, he remarked on the fact that, acting on skilled advice, they had during the last few years always managed to keep ahead of their requirements, both in the matter of the amount of water available and in the means of raising, softening, and distributing it. In the earlier years of the history of the undertaking, it was necessary on many occasions to send the inspectors round the district to warn customers to be economical in the use of water; but now, with the increased number of the Company's wells, and especially the acquisition of fresh ground at Eastbury, they might feel secure as to the sufficiency of the supply of water for many years to come.

Referring to the staff, the Chairman said that Mr. Blackburn, their Engineer, who had done excellent service for the Company, and whose mechanical knowledge had proved of the greatest assistance, was found out by him at Canterbury, more than forty years ago. Unfortunately, indisposition prevented him from being present that day to meet the shareholders. Their Consulting Engineers (Messrs. John Taylor and Sons) had also materially helped to bring the undertaking to its present prosperous condition. In their Secretaries, they had been equally fortunate. First there was the late Mr. Philip Verini, and then his son William, who retired owing to ill-health in 1910, and was succeeded by Mr. C. Purves Sinclair (the present Secretary and General Manager), who was introduced to them by the late Mr. W. B. Bryan, the Chief Engineer to the Metropolitan Water Board. Mr. Sinclair's appointment had satisfied their highest expectations. The wonderful manner in which he had managed from the first to obtain a grasp of the Company's affairs, his mechanical knowledge, the energy with which he had carried out his duties, and the tact and ability with which he had conducted some very delicate negotiations, all proved him to be the right man in the right place. The staff had, of course, been depleted by men joining the forces, which necessitated the work being carried on at high pressure.

After referring to the original members of the Board and the present representatives, he concluded by expressing the hope that, "when this terrible war is over, and normal conditions once more prevail, the success of the Company may continue unimpaired for many generations to come."

WIDNES GAS UNDERTAKING AND THE RATES.

A Bill to Authorize the Allocation of Profits.

A proposal was carried at the meeting of the Widnes Town Council last Tuesday, to promote a Bill to permit, under certain circumstances, the allocation of gas profits in aid of the rates—a power which the Corporation do not at present possess. The matter arose on a resolution of the Finance Committee—"That the Town Council do promote a Bill in the ensuing session of Parliament to amend section 102 of the Widnes Improvement Act, 1867 (Application of Gas-Works Fund), in such manner that the surplus of such fund may, after providing for sinking fund and interest, be carried to the general district fund of the Town Council under, and subject to, the conditions now explained by the Town Clerk, and such incidental and other matters as may hereafter be determined upon; and that it be referred to the General Purposes and Parliamentary Committee to take all necessary steps in the matter."

Alderman S. Owens, in moving the adoption of the Committee's minutes, said that over a year ago the Finance Committee presented a similar resolution; but with a view to giving members more time to consider the matter, it was withdrawn. The position in regard to surplus revenue from the gas undertaking in Widnes differed from every place of importance in England. They were shackled in their method of its disposal, and had no liberty of action. The surplus, notwithstanding any altered or special circumstances calling for exceptional treatment, must at present be applied to the reduction of debt, and to that only. So long, therefore, as there were outstanding loans, the surplus was unavailable; and inasmuch as the gas-works debt was always liable to increase as extensions occurred, notwithstanding the large amounts that were from time to time repaid out of the sinking fund, it was quite clear that the day when the debt would be paid off was so far distant that it was a factor which might be disregarded for all practical purposes. They wanted, therefore, as far as possible, to be in a position to have greater liberty of action, and to apply their surplus to purposes which would be of value to those who were now living and assisting by their efforts and the provision of money in the shape of rates to maintain and build-up a sound financial and prosperous Widnes. To bring this about, they wanted to repeal an obsolete and technical section of an Act of Parliament which had, at all events, served its purpose, and replace it by a modern provision which would, without prejudicing the gas consumer, assist in the greater development of the borough. This they proposed to do by providing for maintenance and improvements; for the payment of interest and sinking fund; and for the building-up of a reserve fund to the extent of 10 per cent. of the capital of the undertaking. After these provisions, the balance would go to the general district fund. All this was subject to the important qualification that if, and when, gas cost the ordinary consumer in the borough more than 1s. per 1000 cubic feet, then the amount to be taken should not exceed £2500 in any year. What could be fairer than this? There were, indeed, some who would prefer to get rid of the latter limitation, and leave the powers of the Town Council unrestricted. The Finance Committee were, however, advised that it would probably excite hostility, and bring about opposition, if they proceeded upon other lines than those proposed, which, he believed, were strictly in accordance with precedent. They had therefore considered it expedient to limit their proposals in the manner stated; and they believed they had evolved a reasonable working arrangement which must commend itself to reasonably minded persons. In 1867, Widnes was a different place from the present town; it was small, and governed by a Local Board upon which owners had a commanding influence. It was at the time most desirable, as it was now, that the price of gas should not be raised to an extent to injure their trade, which was then in an early stage of development. Electricity as a domestic adjunct and power factor was unknown. There were consequently no means of providing for the necessities of the case, except by the monopoly they themselves created, which it was foreseen might not always be controlled by the owners. The provision under these circumstances was not altogether unreasonable; and as a policy it had in the past produced good results. The position was, however, now quite different. Besides having expended large sums for extensions out of profits, they had about £4000 of unappropriated surplus profits. The gas supplied was round about 500 million cubic feet per annum. Another factor was that since the 1867 Act had been framed practically a revolution had taken place in the manufacture of gas, and more particularly in the prominent part in the profit and loss account taken by residual products. The net profits during a period of twelve years ending 1914 amounted to £58,603, or an annual average of £4883 or thereabouts. During this period gas had been sold at a very cheap rate—far below anything that could have been contemplated in 1867—the amount now charged being as low as 1s. per 1000 cubic feet for domestic supply and 8d. for power. In consequence of the vast improvements carried out at the gas-works, they had legitimately expected, not only to maintain, but to increase, the amount of the profit realized. At present it was true that, in consequence of the war and the increase in the price of coal, together with a downward tendency of residuals, they might probably not realize their most sanguine expectations for some short time to come; but they were satisfied that when things returned to normal they would find themselves in their old position of, while supplying gas at the cheapest rate, realizing very substantial profits. In the meantime, they had got to do the best they could and face the position. The figures for the year 1914-15 had not yet, he understood, been considered fully by the Finance Committee; but there was reason to believe that the profit would fall far below the average—indeed, they feared a sufficient sum would not be realized to cover the cost of public lighting. This deficiency would consequently fall upon the general district fund, and have to be met by the rates. It would be seen that the alteration did not, in fact, affect or alter any vital principle; and it was put forward upon the ground of expediency. It was really little more than replacing a cumbersome and difficult clause by a plain and intelligible provision. If the resolution were adopted, the Bill itself containing the necessary clauses would have to be submitted twice to the Council and to a public meeting of inhabitants for approval before Parliament would entertain it. He proposed the confirmation of the minutes, and he appealed to all reasonable people to leave themselves free to do the best they could in the interests of the gas-works and of the Corporation.

Alderman H. S. Timmis (speaking as the Chairman of the Gas Committee) remarked that he might describe himself as being in the position of Balaam or his ass. What he had to say about the present proposal was this: He approved of the old Act, and had in no way changed his view that to the old Act had been due the success of the gas undertaking. He therefore objected to the principle of the present proposal *in toto*. It had been said that Widnes was different from all other towns in the country. In answer to this, he would say that the position of the Widnes Gas Department was different from every other place in the country under the existing arrangements. They could imagine a time when the price of coal might be such, the price of residuals such, and the profits so high that they could afford to supply gas gratis—in fact, pay people to take it. This showed that the principle could be stretched. The point which he had in mind, however, was whether the principle which had been so successful in the past was really applicable to the present state of Widnes. He was trying to find what he believed was a Jesuitical method of reasoning—a justification of "doing evil that good might come of it." He was, in fact, trying to find a reason for changing his opinion; and in this connection he found that there was the blessed word "expediency." And as a matter of expediency, he was prepared to think that there was something in the proposals of the Finance Committee. They had hitherto used the price of gas as an inducement in advertising the town as a centre for manufacturers. This argument, however, did not hold good to-day, because they had gas at a price which was lower than any other place in the country, and there was consequently no object to be attained in reducing it further. They had to face the fact that electricity had come to stay, and that it was an illuminant and motive power which many manufacturers required. The necessity for gas of cheaper price, therefore, disappeared. Then, again, the advantage which the price of gas offered to manufacturers could be offset if the rates of the town were continually rising. Having got the advantage of cheaper gas, it was time for them to consider if it was possible to reduce the rates. In the proposals the Finance Committee had brought forward, he thought they had safeguarded the interests of the gas consumer very satisfactorily. The amount which could be taken from the profits in any one year, and, of course, the powers to be obtained, would only operate when there were profits to deal with. From this point of view, the present discussion was a purely academical one.

Mr. D. Welding said that so far no reason had been given why the matter should be brought forward at this particular moment. It had been stated that no profits were likely to accrue during the coming year; and if this were so, why should they spend a large sum of money in getting the proposed powers? Would it not be better to defer the matter until the war was over and profits were again available? He moved that consideration of the question be deferred until peace was declared.

The Mayor, however, refused to accept the amendment; and Mr. Welding left the chamber.

Alderman Neil said that he believed in the principle of the recommendation. He also believed that many others were of the same opinion. But some of them had a special reason for leaving this over in the present serious circumstances. It would be for the benefit of all to pass the clause, which had been before the Council so long. Last year they agreed with the principle, but deferred it.

Mr. Turton remarked that they had it from Alderman Owens that this matter had been before the Finance Committee, and had been well discussed. Unfortunately, the matter was not discussed at all. He had been waiting patiently for twelve months for information on the subject. As far as he could see, it was not the gas consumers who would benefit by the Council obtaining the powers proposed, but the users of electricity. They would have their rates relieved as a result of gas consumed by other people. It had been said that there were no profits at the present time. He went further, and would say that there would be no profits for the next five years. The Gas Committee had learned in the past few weeks from the Gas Engineer (Mr. Isaac Carr) that he anticipated a loss on the department this year of about £5000. He was prepared to move that the matter be referred back.

Alderman Wood urged that this was not an opportune time to proceed with the matter. At the last meeting of the Gas Committee, it was intimated that they would shortly have to consider the advisability of increasing the price of gas 3d. per 1000 cubic feet.

The Mayor remarked that the proposal to defer the matter need not weigh very much with them. If the principle was right, let them adopt it. Just for the present position the thing might be put in the following few words: They might appropriate the gas profits to the general district fund when there was no debt on the works. The proposal in the resolution was that they might transfer surplus profits to the general district fund as long as gas was 1s. per 1000 cubic feet or under. It recognized the price limit rather than the debt limit. The debt limit had been the principle in the minds of their ancestors. Gas was now about one-fourth the price it was when they made these arrangements. The result of the change would be that: (1) The cost of lighting would be secured by a clearly drawn clause; (2) consumers would be protected against an oppressive advance of prices; and (3) the general district fund would, during the time that gas was cheap, be enabled to promote progress in other directions in their civil life. He was satisfied that through this proposal a greater measure of progress in the town might be registered. High rates, as Alderman Timmis had pointed out, would be a menace to the town's prosperity. This proposal would secure cheap gas, and would make it possible to give ease also to the rates of the town, and without prejudicing the conditions of the consumer. He submitted that in fifty years Parliament would be willing to listen to a proposal to sweep away all restrictions. But it would not be so easy for this to be done if in a new Act of Parliament they embodied a clause securing the consumer's interests at a maximum price of 1s. before surplus profits could be used. Let them mark that there was nothing to prevent gas being brought down even cheaper than 1s. per 1000 cubic feet. It was not the proposal to relieve the town of all rates. It could only hope to work hand in hand with cheap gas. He was confident that it was a proposal in the right direction ; and though it did not lift the dead hand altogether, yet it did relax the grasp to some extent.

Alderman Smith said he could not understand why there should be such grabbing of profits, or why they should be diverted to the relief of the rates.

Mr. Millar pointed out that the aspect of the question which appealed to him was that under existing arrangements it was impossible for him, as a representative of the people, to have a voice in the disposal of the gas profits.

Alderman Owens, in reply, said there were no grabbers. The one before them was the most conservative proposal which had ever been introduced into that chamber. It was possible there had been opposition in other places to diverting gas profits ; but the opposition was caused by the absence of proper restrictions. In the proposal before them, there were restrictions. He appealed to them not to delay the matter, but to embrace the opportunity which presented itself.

On a vote being taken, the proposal was confirmed ; only five of the members voting against.

GAS PROFITS IN AID OF THE RATES.

Principal Graham on "Municipal Mistakes."

Principal J. W. Graham, of Manchester, a member of the Committee of the Coal Smoke Abatement Society, contributes an interesting letter to a Manchester newspaper dealing with the subject of "Municipal Mistakes"—the relation of gas profits to city finance being especially alluded to.

In the course of his argument, Principal Graham states that the "obtaining of revenue indirectly by charging a high price for gas is open to almost every kind of objection. It is deceptive, inequitable, wasteful, and the main hindrance to sunshine and cleanliness in the streets where the poor live. 'Deceptive,' because some financiers seem to think they escape payment if they pay through their gas bill—like getting presents at a tea shop. 'Inequitable,' because the use of gas and electricity bears often little relation to rateable value. The man who confers a public benefit by making no smoke for his neighbour's consumption, and uses gas or electricity for power, or for cooking or heating, pays an extra rate by this wonderful civic policy. The rate varies from a 3d. rate or less, up to a 2s. rate, on small premises using power. Broadly, the owners of cottage property who pay the rates upon them profit, and the cottagers, as well as the large users of light, suffer. 'Wasteful,' because on the bogus gas profit, now £50,000 a year, the city pays enormous income-tax before taking the money for the rates. This loss alone is now enough to pay and maintain the sinking fund or two city parks ; and it is absolutely gratuitous and indefensible. This is, however, but a trifle compared with the loss produced by smoky air, for which gas and electricity are the only immediate cure on a large scale. We waste annually in Manchester not less than £1,000,000 on smoke, in unburnt fuel, dirty clothes, darkness and artificial light, soap, paint, whitewash, renewals of metal and stone work, doctors' bills, asthma, pneumonia, and consumption, and endless toil for the self-respecting woman of the working class, who never ceases to 'clean up' her whole life long. Yet our City Fathers go on, not daring to tell the ratepayers plainly how much is being spent, mere timid watchers upon public opinion, or never looking an inch further than the mere rate. The Finance Committee appear to be a sort of rival firm to the Gas and Electricity Committees, only anxious to get something out of them. We badly need a municipal statesman. I believe if one or two reactionaries were unseated on this issue, the conversion of the rest would be rapid ; but, I fear, not till then. At present there is no gas profit, but a loss. Nevertheless, the £50,000 has to be paid out of this loss. The Corporation ought also, by experiment, to find, or learn, the best way to make a smokeless fuel—thus following the example of Glasgow. One bye-product would be a high quality of gas. Other bye-products would be petrol, or its equivalent, and sulphate of ammonia, a much needed manure, by which our home food supply could be increased. At the present moment, the sulphur goes up the chimney and chokes our throats in the days of fog it helps to produce ; and we seem to love to have it so."

COLNE VALLEY WATER COMPANY.

The report submitted at the half-yearly meeting of the Company—which was held at New Bushey last Tuesday, under the chairmanship of Mr. C. E. Keyser—stated that the expenditure on capital account during the six months ended June 30 amounted to £1656, which included payments in respect of new works at Bushey at the Eastbury pumping-stations, as well as extensions of mains required for affording new supplies to consumers. These extensions of mains brought the total mileage in the Company's area to 277. Supplies had been provided for the erection of 227 buildings ; while 243 new supplies had been added to the Company's books. To meet the growing needs of the district, a contract had been entered into for a second beam-engine at Eastbury. The profit in respect of the revenue account amounted to £16,466. The balance of the dividend and interest account, after paying the interest on debenture and preference stocks, and transferring £1500 to the contingency fund, was £26,379. Out of this balance, the Directors recommended the payment of the full statutory dividends at the rate of 10 and 7 per cent. per annum on the several classes for ordinary stock, and in addition the payment of 1 per cent. (actual) on account of back-dividends on the "A," "B," and "C" stocks, leaving £12,550 to be carried forward.

In the course of his remarks to the shareholders, the Chairman pointed out that the total amount of water-rates for the period under review was £29,371, which was an increase of £489 when compared with the corresponding half of the previous year. This was not so large an increase as the Company had enjoyed on many past occasions; but for this the war was entirely responsible. They had, however, recently noticed signs of a revival of business ; for the percentage of empty properties had never in the Company's history been so low. The revenue expenditure had been rather largely affected by the high prices of material ; the total expenditure being £1589 more than in 1914, though of this income-tax accounted for £991. The Secretary (Mr. C. P. Sinclair) had last year reduced the bad debts to the small amount of 2s. 2d. per £100. Unfortunately, he had not succeeded so well in the period under review, though the amount had only increased to 2s. 5d. per £100, a figure which really was remarkably low when consideration was had to the exodus of the subjects of their enemies from the district—in many cases without paying their water-rates. The average daily supply per head of the population for all purposes was nearly 30 gallons. Since the last meeting, the staff had continued their voluntary work of safeguarding the works at Bushey, and were performing this service in a spirit of great devotion and loyalty to the concern. Many of the staff were actively serving their country, being dispersed in the quarters of severe fighting ; and it was with no small amount of satisfaction he reported that no harm of any kind had befallen them. One of the Directors, however—Mr. S. J. Blackwell—had recently lost a son, who died of wounds received at the front.

When the adoption of the report had been seconded by the Vice-Chairman (Mr. A. Helsham-Jones) and agreed to, the dividends recommended were declared, and a hearty vote of thanks was passed to the Chairman and Directors (on the proposition of Mr. James L. Chapman, seconded by Mr. F. J. Bancroft). It having been announced that the Resident Engineer (Mr. John Blackburn) was somewhat seriously unwell, a vote of sincere condolence with him in his illness was unanimously passed.

This concluded the proceedings at the meeting ; and those present were then conveyed to Eastbury Road, to witness the opening of the Company's pumping-station, as recorded elsewhere in this issue.

NEW WATER-MAIN AT PLYMOUTH.

The proposal of the Plymouth Water Committee to lay a second pipe-line from the storage reservoir at Burrator to the service reservoirs at Roborough, at a cost of £60,000, came before the Town Council yesterday week.

Alderman R. W. Winnicott (the Chairman of the Water Committee) explained that the mains between Roborough and Plymouth had been duplicated, but the means of conveyance between Burrator and Roborough remained inadequate. In 1893, when they obtained power to lay the present 25-inch pipe, they secured sufficient land and the necessary easements for a second line of pipes. The Committee strongly recommended in 1913 that the second pipe should be laid ; but the matter was postponed because amalgamation with Devonport was then under consideration. Now a considerable portion of the Devonport area was supplied direct from Plymouth, and the Devonport reservoir had to be kept as far as possible for the Dockyard consumption, which during the last two years had increased enormously. The matter was one of national importance, affecting the navy and shipbuilding ; while, owing to the large influx of troops, the increase in the consumption of water had been as much as it would be with ten years of normal growth. It had been intended to construct a masonry pipe surrounded with concrete in the bed of the leat ; but this scheme had been abandoned, and it was now proposed to lay a 33-inch cast-iron main along the same course as the existing main. The cost of iron pipes had increased only 5 to 7½ per cent. during the war, whereas the price of cement had nearly doubled. Parliament had granted sixty years for the repayment of the cost of the main ; and roughly it would require the proceeds of a halfpenny rate to cover interest and sinking fund. He believed, however, that the increased consumption in the services would go far to relieve, if it did not altogether obviate, this charge upon the rates. In 1910, the Admiralty took 349,000,000 gallons of water, for which £5718 was paid ; while last year they took 522,000,000 gallons, and paid £10,322.

Alderman Blackall, who seconded the resolution for the adoption of the Committee's recommendation, said it would take nine months to carry out the work, and it was absolutely necessary that it should be proceeded with at once. The annual charge for interest and sinking fund would be £2768.

Alderman Debnam proposed that the recommendation be referred back to the Committee. He expressed the opinion that labour would not be obtained for the work, and that the pipes would cost £2 each more than if they waited until after the war. He referred to leakage now supposed to exist in the leat.

Alderman Littleton said he had asked the Water Engineer (Mr. F. Howarth) if he would take the responsibility of maintaining the supply if the work were not done ; and he said absolutely, "No." If they were to maintain the supply to the Government establishments they must bring more water into the town. The Government had seen the necessity for this work being done ; and for this reason the Admiralty did not oppose the Bill, and the Treasury gave them sixty years for the repayment of the money.

Several members supported Mr. Debnam's view that the leat might be repaired, and made available for use to supplement the supply conveyed by the existing main ; but on a division the Committee's recommendation in favour of proceeding with the work was carried by 29 votes to 19.

The Town Clebk, replying to a suggestion that it was unfair to the bondholders to use the sinking fund in the way proposed for the work, said this matter had been threshed out before the Parliamentary Committee. The Local Government Board said that the security of their creditors was complete. This expenditure was exactly the same thing as borrowing the money in the open market, so far as the holders of their securities were concerned.

The rate of wages of Birmingham gas-fitters has been advanced from 9d. to 10½d. per hour. In the case of men employed by the Corporation Gas Department, the advance is retrospective to May 18.

GLASGOW CORPORATION GAS SUPPLY.

The Accounts of the Department for the year 1914-15.

We have received from Mr. Alex. Wilson, the General Manager of the Gas Department, a copy of the forty-sixth report to the Corporation of Glasgow by the Committee on Gas Supply, with the accounts for the year from June 1, 1914, to May 31 last; the former bearing the signature of the Convener (Mr. T. J. Irwin), and the latter the signatures of the Convener of the Sub-Committee on Finance (Mr. Hugh Alexander) and the Treasurer (Mr. James Fleming). The following are the salient features of the report.

FINANCES.

Dealing first with finances, the Committee show the position by the following tabular statement:—

The gross revenue amounted to . . .		£1,047,773 1 8
The gross expenditure to	£891,889 17 6	
To which is added depreciation written off capital assets	19,901 10 6	
		911,791 8 0
The balance carried to profit and loss account being		£135,981 13 8
The Committee had to meet the following requirements during the year:—		
(1) Annuities on stocks	£20,989 12 5	
(2) Contribution to Glasgow Corporation loans fund, in respect of Glasgow Corporation 3 per cent. stock redeemable in 1921, issued in lieu of converted gas annuities	7,788 4 5	
(3) Interest on borrowed money, &c. . .	35,665 4 7	
(4) Sinking fund	66,275 4 4	
European War—allowances made to employees who have joined His Majesty's Forces	7,918 5 4	
		138,636 11 1
Leaving a deficit on the year's operations of		£2,654 17 5
This has been met as follows:—		
The balance at the credit of the surplus revenue account at the close of the last financial year was		£7,730 14 9
Deducting the deficit above referred to .		2,654 17 5
Leaves to be carried forward		£5,075 17 4

The interest payable to the Corporation loans fund in respect of money borrowed was at the rate of £3 5s. per cent., compared with £3 6s. per cent. for the preceding year.

The Committee applied £3820 10s. 4d. of the amount at the credit of the sinking fund to the extinction of £1685 of 9 per cent. gas annuity stock; and the annuities formerly payable upon these stocks now cease to be a charge upon the revenue of the department. There was also redeemed during the year, by the application of moneys at the credit of the same fund, a further amount of £80,000 of loans raised under the Glasgow Corporation (Tramways and General) Order Confirmation Act, 1905. The amount added to the sinking fund for the redemption of annuities, loans, and 3 per cent. stock was £67,431 14s. This includes £1156 9s. 8d., the accumulations of the unappropriated portion of the sinking fund during the year. The sinking fund, with its accumulations, now stands at £1,192,304 4s. 4d., of which there has been applied in the redemption of borrowed money, 3 per cent. stock and annuities £1,170,562 8s. 4d.; leaving available for either of these purposes the sum of £21,741 16s.

WORKING STATISTICS.

Turning to the working, the Committee express their regret that the market for residuals was unfavourable to the Corporation during the past year. Notwithstanding the greater quantity of coal carbonized, the diminution of income from this source amounted to £25,708. The average price received per ton of coal carbonized was 4s. 1·285d., compared with 4s. 11·436d. for the previous year—a decrease of 10·151d. per ton. The net sum realized from the sale of coke amounted to £133,738; being £11,755 less than that of the preceding year. The total quantity of coke sold was 367,364 tons, compared with 307,984 tons before—an increase of 59,380 tons. The average price received was 8s 2·956d. per ton, compared with 9s. 7·911d. for the previous year—a decrease of 1s. 4·955d. per ton.

The quantity of coal carbonized in the year was 811,356 tons, compared with 781,066 tons in the year 1913-14—an increase of 30,290 tons. The average price paid for coals bought last year was 11s. 5·85d. per ton; being a decrease of 1s. 9·15d. per ton compared with the preceding year. Contracts have been made for the supply of coals during the current year at an average price of 16s. 9·532d. per ton; being an increase of 5s. 3·682d. on the previous prices.

The gas made per ton of coal carbonized was 10,284 cubic feet, compared with 10,386 cubic feet for the preceding year. The quantity of gas delivered and accounted for amounted to 7,693,226,219 cubic feet, compared with 7,469,436,602 cubic feet for the preceding year—an increase of 223,789,617 cubic feet, equal to 2·97 per cent. The greatest quantity sent out during the year in 24 hours was 38,663,000 cubic feet. The maximum daily make was 34,213,000 cubic feet. The unaccounted-for gas was 7·796 per cent., compared with 7·928 per cent. for the preceding year—a decrease of 0·132 per cent.

DISTRIBUTION, ETC.

After giving a long tabular statement showing the sales of gas in the various districts of the city and suburbs in the past and the preceding year, the Committee turn to matters connected with distribution, and furnish the following particulars.

Gas-Meters.—The number of ordinary meters in use on the 31st of May last was 195,557, compared with 202,303 for the preceding year—a decrease of 6746. The number of prepayment meters in use on that day was 97,461, compared with 88,008—an increase of 9453, and giving a net increase of 2707 meters. During the year, 36,565 meters were repaired, and 8216 ordinary ones were converted into prepayment meters.

Gas Cooking Appliances.—The demand for domestic gas cooking appliances was maintained during the year. On May 31 last there were on loan 124,825 cookers and range fittings, 25,473 grills, and 47,358 boiling-burners—a total of 197,656, compared with a total of 172,152 for the preceding year.

Gas Heating Appliances.—The improved appliances now produced by the various makers have greatly stimulated the more extended use of gas heating appliances, both for domestic and manufacturing purposes. The number of gas-fires on hire on May 31 last was 42,281—an increase of 17,941 over the preceding year; and the number on hire-purchase was 3198. The number of radiators on hire was 3399.

Gas Water-Heating Appliances.—The moderate cost and convenience of the new water-heating appliances for domestic purposes are meeting with much favour and interest from consumers. At May 31 last, there were 104 on hire-purchase and 323 on simple hire. In the preceding year, the number on hire-purchase was only 81.

Gas-Engines—The number of gas-engines in use, and the total brake-horse-power, for the past and the preceding year were as follows:

	Number.		Brake-Horse-Power.
May 31, 1915	1294	..	19,530¼
May 31, 1914	1372	..	19,804¾
Decrease . .	78	Decrease . .	274½

Mains.—About 7¼ miles of new mains were laid during the year, which brought the total up to 1064 miles.

WORKS AND MAINS.

The works and mains have been maintained in an efficient condition during the year out of revenue.

PRICE OF GAS.

In consequence of the abnormally increased prices for coal and other gas manufacturing commodities, and keeping in view the state of the market for residual products, the Committee recommend that the price of gas be increased (1) by 7d. per 1000 cubic feet to all classes of consumers within the city supply district and the supplementary supply district within the parish of Old Kilpatrick, (2) within the supplementary supply district outwith the parish of Old Kilpatrick, 50 per cent. extra—the increase to take effect as from the date of last survey.

WORK OF THE STAFF.

The Committee conclude by expressing their pleasure that, notwithstanding the extraordinary conditions brought about by the war, the diminution of available labour, and the extraordinary demands placed upon the department, the whole staff have responded magnificently to every call. They also desire to place on record the retirement of the Treasurer (Mr. Fleming) after 46 years of faithful and efficient service. He carries with him in his retirement the very best wishes of the Committee.

STATISTICAL STATEMENTS.

The report of the Committee is followed by the accounts of the Gas Department set out in the usual form; and an appendix contains (*inter alia*) memoranda of gas made, sold, &c., for each year from that ending May 31, 1901, down to the last. We give below the particulars for the past two years.

Memoranda of Gas Made, Sold, &c.

—	Year Ending May 31, 1914.	Year Ending May 31, 1915.
Quantity of gas made . . . cubic feet	8,112,616,000	8,343,718,000
Do. sold or accounted for . ,,	7,469,436,602	7,693,226,219
Do. unaccounted for . . . ,,	643,179,398	650,491,781
Do. do. . . . . per cent.	7·928	7·796
Average price received per 1000 feet sold .	1 10·[illegible]	1/10·7[illegible]3
Average price per ton of coal carbonized .	13 1·[illegible]	12 5·178
Cost of coal per 1000 cubic feet of gas made	1/3·18	1/2·[illegible]2
Capital employed per 1000 cubic feet of gas sold	6/3	6/8
Coal in stock at beginning of year . tons	84,511	100,230
Coal received during year . . . . ,,	796,785	800,857
Coal carbonized during year . . . ,,	781,066	811,356
Coal in stock at close of year . . . ,,	100,230	89,731
Quantity of coke sold . . . . . . ,,	307,984	367,364
Average price received per ton of coke .	9 7·911	8/2·956
Quantity of coke sold, per ton of coal carbonized	7·886 cwt.	9·055 cwt.
Average price received for ammoniacal liquor and tar per ton of coal . . .	4 11·436	4/1·285
Quantity of gas made per ton of coal . .	10,386 c. ft.	10,284 c. ft.
Quantity of gas sold or accounted for, do. .	9,563 ,,	9,482 ,,
Quantity of gas unaccounted for, do. . .	823 ,,	802 ,,
Illuminating power of gas prescribed . .	14 cand.	14 cand.
,, ,, ,, supplied . . .	17·48 ,,	17·[illegible] ,,
Number of public lamps—flat-flame . .	554	508
,, ,, ,, incandescent .	29,522	29,682
High-pressure lamps	67	81
Cookers and range fittings on hire and on loan	109,338	124,825
Grills on loan	25,152	25,473
Gas-rings on loan	37,662	47,358
Gas-heating appliances sold—hire-purchase system	4,119	3,302
Gas-heating appliances on hire	26,787	45,680
Gas heating and cooking appliances sold .	4,183	3,111
Number of meters in use—ordinary. . .	202,303	195,557
,, ,, ,, —prepayment .	88,008	97,461
Capacity of holders—cubic feet	44,376,000	44,376,000
Greatest quantity of gas delivered in one day, cubic feet	38,243,000	38,663,000

MANCHESTER MUNITION PROSECUTION.

Messrs. R. & J. Dempster's Workmen Fined.

An important prosecution under the War Munitions Act was heard at the Manchester Town Hall on Saturday, before Mr. A. J. Ashton, K.C., the Recorder of the City; the Assessors sitting being Mr. Leonard Massey (for the employers) and Mr. Frank Williams for the men.

The defendants were fourteen labourers employed on munition work by Messrs. R. & J. Dempster, of Miles Platting, Manchester. The Recorder had the defendants separately before him.

Mr. Gilbert Jordan, barrister, who conducted the prosecution, said that on Aug. 5, owing to a grievance about wages, the men left their employment. In previous disputes, the men had always seen the night foreman before striking; but in this case they had not done so. In an interview, the men were told of the penalties of leaving work under the Munitions Act; but it was not until Tuesday, Aug. 10, that work was resumed. The men had since received an advance of 2s., making 25s., and 10 per cent. war bonus irrespective of hours.

The men, who were not legally represented, stated that they did not know they were on munition work until told by Mr. Henry Knight, the Works Manager.

Mr. Jordan added that the present proceedings had been instituted for the purpose of bringing it home to the men engaged by Messrs. Dempster that they came within the provisions of the Act, and that they must not absent themselves because of a supposed grievance.

Evidence having been given for the prosecution,

One of the defendants declared that the dispute had arisen not so much because of a wages grievance, but owing to the works being shorthanded. Some men, he alleged, had left, and gone to other works; and yet they had not been summoned. It accordingly appeared to him and other workmen that they were not engaged on munition work.

Mr. Knight denied this—asserting that labourers had only been permitted to leave in proportion to the moulders with whom they worked.

Another defendant said it was true that they were warned against infringing the provisions of the Munitions of War Act by striking before their differences with their employers had been reported to the Board of Trade. When, however, they heard the Act read, they candidly confessed that they had "made a mess of things." They certainly were unaware that they were engaged on munition work. They were not then members of the National Union of Gas Workers and General Labourers, or they would not have been allowed to go out. They had, however, since joined the Union.

Mr. Knight, replying to the Recorder, said this was the first time there had been anything in the nature of a strike at the works since the war started. He had always been willing to hear the men's complaints; and as a rule matters were amicably adjusted. On Aug. 5 the labourers suddenly ceased work, and sent a deputation of three to see him. He reminded the men of the Munitions Act, and its provisions regarding arbitration—advising them to return to work. But they did not do so, and absented themselves for the following two days (Friday and Saturday). On the Monday another deputation came from the labourers; and he told them that an undertaking of some sort must be given, to ensure that this kind of thing would not happen again. The undertaking was not given; but the men went away as though they were prepared to return to work. The moulders who had been stopped owing to the absence of the labourers required an undertaking that the labourers would not be allowed to go on strike when they wished.

In reply to Mr. Williams, witness said that eventually the moulders and labourers had a meeting; the result being that things were fixed up satisfactorily. Work was resumed on Tuesday last.

One of the defendants pleaded that he twisted his back on the day before the strike commenced, and consequently he could not go to work until the Monday morning. He then found that the moulders would not start.

The Recorder accepted this explanation, and the summons was withdrawn.

The Recorder's Warning.

Addressing another of the defendants, the Recorder remarked that if he took the line that he would not go back to work until he had got all he wanted, he might have to go to prison. The men knew their remedy—they could have arbitration, but they must not go out.

Most of the men declared that they were unaware that they were on munition work, and each was informed that the next penalty would be imprisonment.

In giving judgment, the Recorder stated that he had taken into consideration the fact that many of the men were unaware that it was Government work they were on until they were told. Eleven of the defendants would be fined 5s., one 10s., and a youth 1s., the money to be paid within twenty-one days. Had the men been aware that they were engaged on Government work, he would have had to have dealt with them more severely.

Messrs. Dempster's did not press for costs.

Middleton Gas Prices Increased.—At the last meeting of the Middleton (Lancs.) Town Council, the proposal of the Gas Committee to increase the price of gas for lighting and power purposes 4d. per 1000 cubic feet, as and from July 1, was approved.

Tralee Gas-Works.—The Tralee Urban Council have agreed to the erection of a carburetted hydrogen gas plant at the gas-works, as an auxiliary to the coal gas-making plant; and the tender of Messrs. Bale and Hardy has been accepted, at £1100. The plant will be capable of producing 100,000 cubic feet of gas per day; and the cost of manufacture is guaranteed to be not more than 1s. per 1000 cubic feet.

No expert adjustment required

to right any wrong principles

THE "CAPTIVE FIRE" FURNACE

MELTS BRASS BY ITSELF
AT THE RATE OF 2 CUBIC FEET PER LB.
AND HEATS STEEL BILLETS TO 1000° C. AT A RATE
NOT EXCEEDING 1·2 CUBIC FEET PER LB.

Once adjusted it does not require to be touched
as long as the quality of gas is the same.

A lighted taper, turn on the gas tap, and then the air, and the furnace is working.

See "Journal" for May 25 and June 1 & 8 (pp. 471, 525, & 596).

For further particulars apply to—

A. C. IONIDES, 34, Porchester Terrace, W.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

At the last monthly meeting of the Fraserburgh Town Council, the Provost intimated that the Gas Committee had unanimously resolved that for the current year it would be necessary to raise the price of gas from 4s. 2d. to 5s. per 1000 cubic feet owing to the increased price of coal in consequence of the war. The gas used for manufacturing purposes would be increased in proportion—from 3s. 9d. to 4s. 7d. In the course of the proceedings, Bailie Anderson said the reason those who used gas for manufacturing purposes got it at a lower rate was because they used it in the day time. But this did not apply now, as some used it in order to generate electricity. While it might be better to adopt the Committee's recommendation now, he thought gas should be sold at a uniform price to all. Mr. Robb dissented from Bailie Anderson, and pointed out that Aberdeen supplied gas for manufacturing purposes at 1s. 7d., in order to encourage industry. The recommendation of the Committee was agreed to.

The development of the business side of the Dundee Electricity Department has seemingly been arrested for the time being. At a meeting of the Committee some days ago, the Convener (Mr. Nairn), in replying to a question, said that the department could not at present undertake any new lighting or power installations, unless it was for Government work. The cause of the inability to accept new work was, he added, that they had too few men.

The price of gas at Peterhead has been advanced by 6d. per 1000 cubic feet—to 4s. 2d.

The Keith Town Council some time ago accepted the offer of a local builder for the construction of a reservoir at Cuthill in connection with the recently introduced water supply from Cairnie. The work was commenced some time ago, the excavations completed, and the floor of the reservoir laid. At a recent meeting of the Council a letter was read from the Local Government Board asking whether the Council could see their way to postpone the completion of the work for some time. The Council have replied that they are agreeable, provided a loan for the outlay already incurred be given at the original rate—4 per cent.—and that the balance of the loan when required be given at the same figure.

Dundalk Gas Company and Municipal Accounts.—At the recent audit by Mr. Reddy, Local Government Board Auditor, of the accounts of the Dundalk Urban Council, Mr. George Airth (the Secretary and Manager of the Dundalk Gas Company), and Mr. Smyth, of Belfast (the Company's Auditor), attended and raised a number of points for the Official Auditor's consideration. Objection was taken by the Chairman of the Council to the status of Messrs. Airth and Smyth, and to their being allowed access to the books of the Electric Department.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Aug.* 16.

The tar products market remains steady. There is a growing inquiry for pitch for the coming season, and the price is unaltered at 26s. per ton net in bulk at makers' works. Other products remain without change at the values last recorded.

Sulphate of ammonia continues steady at £14 8s. 9d. per ton net in buyers' bags at makers' works for 25 per cent. quality.

Tar Products in the Provinces.

Aug. 16.

The markets for tar products have remained fairly steady throughout the past week. Little business can be done in pitch, as buyers will not pay the prices being asked at the present moment. Solvent and heavy naphthas are in fair demand, and maintain their price. Creosote is quiet, and it is stated that large quantities are being offered at very reasonable figures. Business is reported in crude carbolic at 3s. 6d. to 3s. 7d. per gallon.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 6d. to 25s. 6d. Pitch, London, 23s. to 24s.; East Coast, 22s. to 23s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. Clyde. Benzol, 90 per cent., naked, 11½d.; North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3d. to 3$\frac{1}{16}$d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 6d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

Liverpool, *Aug.* 14.

Throughout the week the market for this article has remained in a lethargic state, but values have been fairly well maintained. Few fresh orders have come forward, and the delay on the part of the War Trade Department in issuing export licences has continued to hinder shipments against former contracts. The quotations at the close are £14 11s. 3d. to £14 12s. 6d. per ton f.o.b. Hull, £14 12s. 6d. to £14 13s. 9d. f.o.b. Liverpool, and £14 15s. to £14 16s. 3d. f.o.b. Leith. Manufacturers have now modified their views a little in regard to the forward position, and have reduced their price for October-March

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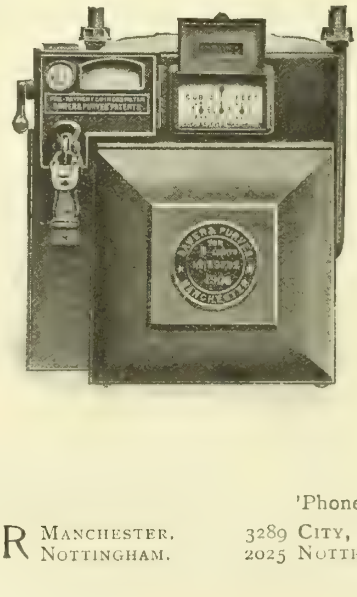

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delivery to £15 to £15 2s. 6d. at the ports; but no actual business has transpired.

Nitrate of Soda.

The values on spot have advanced further; to-day's quotations being 12s. 9d. per cwt. for ordinary, and 13s. for refined.

Sulphate of Ammonia.

From another source it is stated that this market has been exceedingly quiet throughout the past week, and lower prices have been accepted in several instances. There is certainly a weakening, and one or two lots have been offered without finding buyers. Outside London, makes are quoted at £13 2s. 6d.; Hull, £14 12s. 6d.; Liverpool, £14 15s.; Leith, £14 17s. 6d.; Middlesbrough, £14 12s. 6d.

COAL TRADE REPORT.

Northern Coal Trade.

There is a slight ease in the coal trade, due in the main to the irregular granting of licences for the export of coal under the new regulations, so that cargoes are thrown on to the home market. In the steam coal trade, the demand is fair, and the prices show slight variations. Best Northumbrians are quiet at 20s. 6d. to 21s. 6d. per ton f.o.b.; second-class steams are 16s. 6d. per ton; and steam smalls are from 13s. 6d. to 15s. 6d. per ton, with a fair demand, and with shipments that are rather above those of a year ago. Production of gas coals is now pretty full, when the lessened number of men at the collieries is taken into account. There is an increasing demand; and the amounts that are being shipped will help to increase the stocks. Best Durham gas coals are steady, at 20s. 6d. to 21s. per ton f.o.b.; second-class qualities are about 17s. to 18s. per ton; and "Wear Specials" are quoted at 23s. per ton f.o.b. There is the improving demand that is above referred to; and the larger demand for other classes of Durham coals also affects the price of gas coals—sales of Durham unscreened being reported for next year at about 17s. 6d. per ton f.o.b. Contracts for gas coals are few at present—buyers waiting to see what the limitation of prices under the new Act may lead to. Freights on gas coal are steadier—on the basis of 7s. Tyne to London, and 13s. 6d. to Rouen, which show the cost of the sea-carriage of gas coal to two of the great markets at present. It is hoped that the Durham miners will allow suspension of some regulations to permit of a fuller output. In coke, the inquiry is fairly full. Gas coke is steady in price; for good qualities, 26s. to 27s. per ton f.o.b. in the Tyne is about the present quotation.

Canadian Loyalty.

There was an enthusiastic scene at a prize-giving of the Toronto Consumers' Gas Company Rifle Association, when the President (Mr. A. W. Austin) announced that he had decided to present, at his personal expense, a rapid-firing gun to the Canadian Department of Militia. He expressed gratification at the enthusiastic patriotism of the Company's employees, over 140 of whom had enlisted for active service. Amid the rejoicing there was, however, the stern fact to be faced, that after a year of battles the end of the war was not yet definitely in sight. While there was no reason for Britons, and especially Canadians, to be downhearted, the situation was still one which called for serious thought on the part of every man physically fit and free to enlist. The Company were proud of the record already made by the employees, and would gladly give every encouragement to any others who might decide to go to the front. He regarded it as of the utmost importance that the Canadian regiments should be equipped with machine guns to the fullest extent required by maximum efficiency, and said they had decided to contribute to the cost of one machine gun to be placed at the disposal of the Ottawa Department of Militia as speedily as possible. Mr. Arthur Hewitt (the General Manager) said it afforded him great pleasure to learn that employees of the Company were also raising the money to present an additional machine gun to the Canadian forces. He congratulated the officers and members of the Rifle Association on the promptness with which they organized for military training immediately after the outbreak of the war. He understood that the Association could, within two hours, place 200 men fully armed at any given point within the city limits in case of an emergency call.

Gas Workers and War Badges.—The following remarks on the provision of war badges [which forms the subject of a communication from Mr. W. T. Dunn which will be found on another page] appear in the "Birmingham Gas Department Magazine." For some time past the Gas Committee have been urging the War Office to provide badges for those members of the staff and workmen whose services are essential for the production and supply of gas in Birmingham. As no satisfactory reply has yet been obtained, and as numbers of the workmen are still enlisting and seriously jeopardizing the position at the works, the Gas Committee have decided to issue a Departmental Badge to all men who are essential. This is the best that can be done; but the action (or rather inaction) of the War Office still leaves the position unsatisfactory. For the maintenance of the manufacture of munitions in Birmingham, the provision of an efficient gas supply is necessary; and in our opinion the task of the department would have been more easily fulfilled if Government, instead of departmental, badges had been forthcoming.

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HAVE PROVED TO BE
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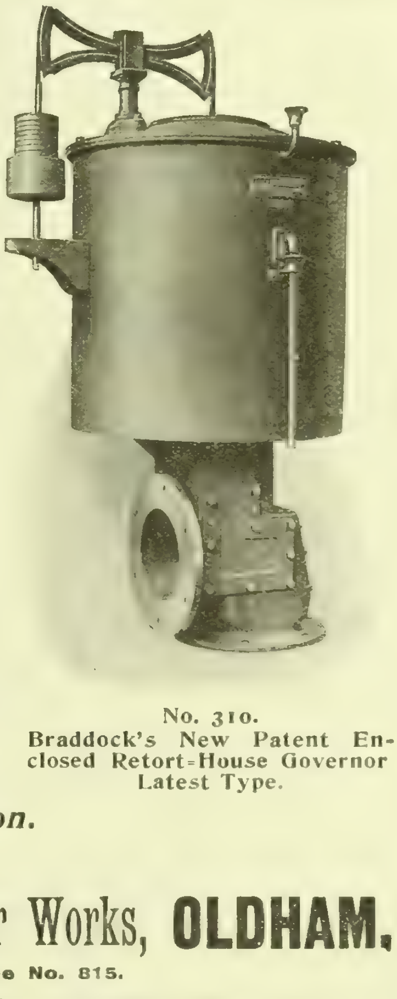
Braddock's New Patent Retort-House Governor is a further improvement and is especially desirable for use with Vertical Retorts.



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Portsea Island Gaslight Company.

In the report for the half year ended June 30, which will be submitted at the meeting on Thursday of this week, the Directors state that the profit and loss account shows an available balance of £40,990, which enables them to recommend the declaration of a dividend for the half year at the following rates per annum: 13 per cent. on the "A" and "B" shares; 12 per cent. on the "C" shares; 10 per cent. on the "D" and "E" shares; and 5 per cent. on the 5 per cent. (maximum) stock (less income-tax). This will leave a balance of £22,308 to be carried forward. Notwithstanding the abnormal conditions, the quantity of gas sold was only 2·74 per cent. less than during the corresponding half of 1914, which showed an unusually large increase over any like period. The number of consumers and the number of cooking and heating appliances on hire continue to increase. Owing to the restricted means of transport by rail and sea, great difficulty has been experienced in obtaining adequate deliveries of coal and oil fuel. This, and serious shortage of labour, have occasioned the management considerable anxiety. The new chief offices and show-rooms were opened on the 19th ult.; and the greatly improved facilities which these premises afford for the conduct of the Company's business are much appreciated both by the public and the staff. The Engineer and General Manager (Mr. J. D. Ashworth) reports that the buildings and plant at the several stations, and also the mains and meters, have been adequately maintained, and are in efficient working order. The Directors recommend the usual donations of £50 and £5 5s. to the Portsmouth, Portsea, and Gosport Hospital, and the Portsmouth Eye and Ear Infirmary respectively; also the distribution of coke to the value of £100 among the poor resident within the limits of the Company's supply during the ensuing winter.

◆

Tunbridge Wells Gas Company.

Presiding at the half-yearly meeting of the Company last Wednesday [when dividends at the rates of 13, 10½, and 10 per cent. per annum were declared], the Chairman (Alderman W. H. Delves) said that, having regard to the great increase in the cost of coal, it was a subject for congratulation that the Directors were able to recommend the usual dividends, and had not had to increase the price of gas. In June this year the Company were paying 30s. per ton for coal which they bought at 18s. 7d. per ton a year ago; but he contemplated some reduction as a consequence of Government action. The results for the half year were very satisfactory; for the Engineer (Mr. Andrew Dougall) had been able to produce 200 cubic feet of gas per ton more than last year. The presence of so many troops in the town had led to a considerable increase in the consumption of gas—but the restriction of lighting made it very doubtful whether this increase—which, by the way, was a record in the history of the Company—would be continued in the second half of the year. So far the town had not been raided; and he hoped it would be possible to relax the present conditions, not only for their sake as a gas company, but because of those who had to use the streets at night. While they hoped to manage without any increase in the price of gas, it was manifest that if the present cost of coal continued for any length of time the Directors would have to consider the matter. Judging from the reports of the meetings of other undertakings, it was an almost unique experience for a gas company not to have to raise the price. About fifty of the Company's employees were at the front; three had been killed in action; while one had died of disease. They very much regretted the loss of these men, and their sympathies went out to those who were left behind. The consolation was they had died, not for themselves, but for their country, in fighting against the horrors committed by "those German brutes."

◆

Lighting a Government Housing Site.

The question of lighting the roads on the Government housing site at Woolwich has been under the consideration of the Works Committee of the Woolwich Borough Council. The houses are now being let; and it is necessary that arrangements should be made to erect the required number of lamps before the dark evenings set in. As electricity is not available for public lighting on the estate, the Deputy Borough Engineer had an interview with Mr. Talbot, the Superintendent of Lighting to the South Metropolitan Gas Company, who stated that the Office of Works had suggested that a column more ornamental in design than the ordinary pattern should be used in the estate roads. Mr. Talbot forwarded photographs of various columns, which were submitted to the Committee. The prices were as follows: "Eddystone" column, fitted complete with "South London" lantern and inverted burner, £7 7s. 6d.; "Eddystone" column, fitted complete with "Metro" improved lantern and inverted burner, £5 17s. 9d.; ordinary column, fitted with "Metro" improved lantern and inverted burner, £4 7s. 9d. These inverted burners give a light of 120-candle power. On the portion of the estate east of Well Hall Road, approximately 70 lamps will be required, and about 50 on the west side, making a total of 120. The first cost of erection is estimated at (1) for "Eddystone" column with "South London" lantern, £885; (2) for "Eddystone" column with "Metro" lantern, £706; and (3) for ordinary column with "Metro" lantern, £526. The cost of lighting and maintenance for 120-candle power lamps is £3 10s. 7d. each per annum, representing an annual expenditure of £423; or if fitted with No. 2 burners, the price for maintenance is £2 15s. 3d., or an annual expenditure of £331. In the Committee's opinion, the ordinary column, fitted with "Metro" lantern and No. 2 burner, as used in the majority of side steets in the district, is quite suitable for the roads on the Government estate. They accordingly asked the Finance Committee to pass a supplemental estimate to cover the first cost of erecting these lamps, and to cover the cost of maintenance from September next, estimated at £165.

◆

Wexford Gas Company.—At a meeting of the Wexford Corporation, Mr. M'Guire proposed that the Gas Company's account for £518 should be reduced by amounts commensurate with the number of lamps that were found to be unlit. He contended that the Gas Company had made no effort to meet the Corporation in this matter. They wanted value for their money, and in his opinion they were not getting it. It was decided to pay the Company £500, and retain the balance.

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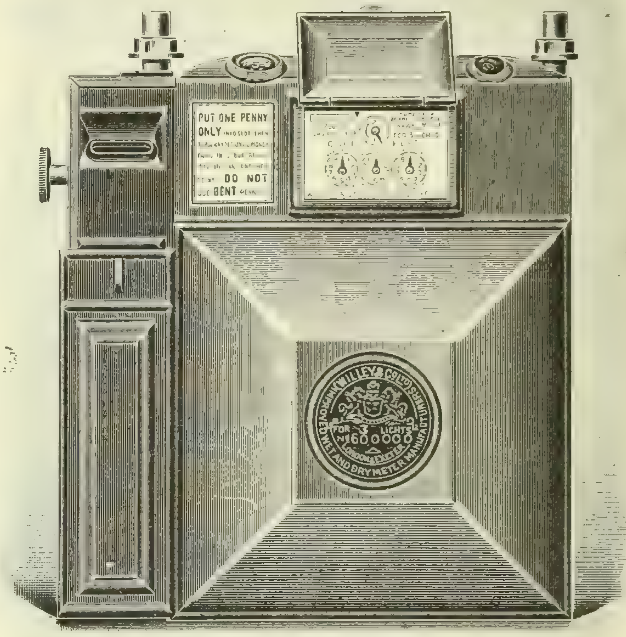

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Dublin Reservoir Dispute Settled.

The Dublin Corporation, at a special meeting last Thursday, had before them a report from the Lord Mayor (Mr. J. M. Gallagher) and Alderman Farrell, the Chairman of the Water-Works Committee, recommending a compromise in reference to a claim for extras in relation to the contract for the new reservoir at Roundwood—the Council to pay £2200, and the Contractor (Mr. Mackay) to abandon all claims comprised in a statement submitted by him, and also all claims for delay. Mr. Mackay had agreed to this, provided the amount were increased to £2500 and 15 per cent. more on the value of the new plant already put on the works, which would amount to £750. Under the terms of the contract, he was entitled to a sum of £5000 for new plant, 75 per cent. of which amount was payable when the plant was put on the works. The Lord Mayor and Alderman Farrell now asked the Council to accept this modification, since it would wipe-out the prospect of any serious and troublesome litigation, and would also obviate the stoppage of the works. Several members wished to have the matter postponed, pending further consideration by the Water-Works Committee; but the suggestion of the Lord Mayor and Alderman Farrell was endorsed by 17 votes to 5.

◆

Illegal Badges.—The Minister of Munitions (Mr. Lloyd George) has announced the rule he has made under the Munitions of War Act with respect to war service badges. The rule says: "No person shall, except with the express authority of the Minister, make, sell, issue, or wear any badge similar in form or appearance to any badge supplied or authorized by the Minister, or any colourable imitation thereof, or any badge or other distinctive mark calculated or intended to suggest that the wearer is engaged on munitions work or other work for war purposes." Under the Munitions of War Act, any person who acts in contravention of this rule is liable for each offence to a fine not exceeding £50.

War Bonus Question at Oldham.

A Special Committee of the Oldham Corporation last Thursday night discussed for nearly four hours the question of granting a war bonus to their employees. The original application [*ante*, pp. 45, 307] was for a war bonus of 5s. per week for men engaged in the Gas and Water Departments; but this application was followed by others, the Committee being faced with what was practically a general demand for an advance in wages. The application of the Gas Workers' Union had twice been refused by the Town Council; but a week ago the men threatened to come out on strike unless their claim was granted or referred to arbitration. As a result, a Special Committee was appointed to consider the whole question. Mr. J. R. Clynes, M.P. (the General Secretary of the Union), and a deputation of the men waited upon the Committee, and impressed upon them the necessity of an immediate settlement of the men's claim. The question was then privately discussed by the Committee, who decided to recommend that a bonus of 2s. per week be granted to all employees of the Corporation over 21 years of age whose wages do not exceed 28s. per week, and 1s. per week to those in receipt of 29s. per week—the bonus, therefore, being confined to those whose wages, including the war bonus, will not exceed 30s. per week. A special meeting of the Town Council has been called for to-morrow (Wednesday); and if the recommendation is sanctioned, the advance will date from last week.

◆

Danger of a "Slack" Gas-Tap.—In the course of an inquiry at Preston concerning the death from gas poisoning of a very young maidservant, it was stated that the tap of the gas-bracket in deceased's bedroom [where she was found dead] was "rather slack" and that anyone turning it off might very easily turn it on again accidentally. It was only a week since the girl had left her home in the South of Ireland, where she had not been accustomed to the use of gas. The Jury returned a verdict of "Death through misadventure."

GAS COMPANIES IN THE STOCK EXCHANGE.

As might be expected, business on the Stock Exchange last week was very quiet again. The daily record was slight, and the House was closed altogether on Saturday. But the general tone was by no means unsatisfactory, and several markets, despite a lack of activity, exhibited some strong points. Operations bulked largely in the Government issues, among which there was very fair activity in the War Loan and the convertible issues linked therewith, which closed steady after a momentary slight drop and subsequent recovery. Home Rails continued dull on the whole. The North-Western Company's preference stock issue [referred to last week] was a success, and the list was closed a day before the date-limit. Canadian interests were bright, encouraged by good harvest prospects and the maintenance of the Canadian Pacific dividend. American, South African, and the Foreign Market had some good points; and the firmness of warlike appliances in the Miscellaneous Market was conspicuous. Business in the Gas Market was quiet—apparently settling down to what appears to be becoming the normal average. Transactions were neither heavy nor numerous; but they tended rather to foreshadow a strengthening tendency. This feeling has probably been influenced by the reported proceedings at recent meetings of important companies. These were characterized by the conspicuous fairness with which the Chairmen placed before the proprietors the unfavourable factors which had beset their undertakings during the past half year, and the discreet moderation with which they dwelt upon the points of improvement to be descried in the future. The satisfaction and the grateful appreciation of the shareholders were everywhere heartily forthcoming. The Money Market received an influx of gold which produced ease.

Bargains done for cash during the week were as follows: On Monday, Bournemouth "A" 26⅛, 26¼, ditto "B" 12$\frac{3}{10}$, 12¼, ditto preference 11, 11$\frac{1}{20}$, European 11¾, Imperial Continental 56, South Metropolitan 81½. On Tuesday, Gas Light ordinary 81, 81¼, 81½, ditto maximum 60½, ditto preference 73, ditto debenture 62, 62¼, 62½, South Metropolitan 82½. On Wednesday, Commercial debenture 55½, 55¾, Gas Light ordinary 80½, 81¾, ditto preference 72, ditto debenture 62, 62½, South Suburban debenture 95¾. On Thursday, Commercial 4 per cent. 85, 87, *ex div.*, Gas Light ordinary 78½, 79⅝, 81, 81½ *ex div.*, ditto preference 73, South Suburban debenture 96¼. On Friday, Commercial debenture 57½, 58, Gas Light ordinary 80, ditto preference 70¼, 70⅞, 71⅛ *ex div.*, Ilford debenture 75½, South Metropolitan 81½ *ex div.*, South Suburban debenture 95, 96½.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING AUG. 14.

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d	
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	..
374,000	"	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7½	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	..
50,000	10	Feb. 26	16	Bournemouth Gas and Water 10 p.c. . .	29—30	5 6 8	26⅛—26¼
873,480	10	"	7	B 7 p.c. .	15—15½	4 10 4	12¼—12$\frac{3}{10}$
95,000	10	"	6	Pref. 6 p.c.	13½—14	4 5 9	11—11$\frac{1}{20}$
—	—	—	—	Deb. . .	..	—	..
380,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
830,000	"	"	11	Do. New . . .	204—209	5 5 3	..
50,000	"	"	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
206,250	"	June 11	4	Do. 4 p.c. Deb. .	91—93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	"	"	8	Do. A Ord. Stk. .	154—159	5 0 8	..
530,000	20	Mar. 26	12½	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	Do. 4½ p.c. Pref. .	4—6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	85—87*
560,000	"	"	5⅓	Do. 3½ p.c. do. .	103—105	5 1 6	..
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	55½—58
800 000	Stk.	"	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	"	"	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	Derby Con. Stk. . . .	123—125	4 16 0	..
55,000	"	—	4	Do. Deb. Stk. .	102—104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd. . . .	17½—18	5 11 1	11¾
16,364,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke 4 p.c. Ord. . .	98—102	4 15 6	78½*—81¾
2,600,000	"	"	3½	3½ p.c. max. .	76—79	4 8 7	60½
4,062,235	"	"	4	4 p.c. Con. Pref.	96—99	4 0 10	70¼*—73
4,674,850	"	June 11	3	3 p.c. Con. Deb.	72½—74½	4 0 6	62—62½
130,000	"	"	10	10 p.c. Bonds .	..	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16¼—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p c. . . .	..	—	..
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C . . .	151—154	5 2 4	..
65,780	"	"	6⅞†	Do. B	115—118	5 8 0	
65,500	"	June 26	4	Do. 4 p.c. Deb. . .	92—94	4 5 1	75½
4,940,000	Stk.	May 14	9	Imperial Continental .	150—160	5 12 6	56
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c. .	119—121	5 7 5	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. A	211—213	4 13 11	..
718,100	"	"	7	Liverpool 5 p.c. Ord. B	146—14	4 14 7	..
306,083	"	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	—
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd. . .	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	98½—99½	4 10 6	
529,705	Stk.	June 26	3½	Do 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	..
300,000	Stk.	May 14	8	Oriental, Ltd. . . .	117—122	6 11 2	..
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .	7¼—7¾	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B . .	128—131	4 19 3	..
100,000	50	"	12	Do. C . .	118—121	4 19 2	..
52,000	50	"	10	Do. D . .	..	—	..
249,980	5	April 29	8	Primitiva Ord. . . .	5½—6	6 13 4	..
499,960	5	June 26	5	" 5 p.c. Pref. .	4¾—5	5 0 0	..
521,600	100	June 2	4	" 4 p.c. Deb. .	91—93	4 6 0	..
—	—	—	—	" " " 1911	..	—	..
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	San Paulo 5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 3	..
209,984	"	"	10	Do. B	222—224	4 9 3	..
523,500	"	"	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African . . .	10½—11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	81½*—82½
1,895,445	"	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	..
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	..
60,000	"	"	5	Do. 5 p.c. Pref. .	110—112	4 9 3	..
—	—	—	—	Do. West Kent. .	..	—	..
137,058	"	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	95—96½
629,740	Stk.	May 14	5	Southampton Ord. . .	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c. .	135—138	5 8 8	..
742,275	"	"	6†	B 3½ p.c. .	115—117	5 2 7	..
181,255	"	June 26	4	4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅝	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	"	"	6⅞	" B 3½ p.c.	129—134	5 2 7	..
108,075	"	"	5/17/3	" C 3½ p.c.	110—115	5 2 0	..
352,000	"	"	6⅛	Wimbledon 5 p.c. .	117—122	5 0 5	..
98,000	"	"	6⅝	Epsom 5 p.c. . . .	121—126	5 5 2	..
88,416	"	June 26	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

* Ex Div.

Chester United Gas Company.

The 94th ordinary general meeting of the Company was held last Thursday—the Chairman (Mr. J. M. Frost) presiding. The report stated that the balance of revenue carried to profit and loss account was £3206, and a sum of £2250 had been transferred thereto from the reserve fund. Out of the balance standing to the credit of profit and loss account, the Directors recommended the payment of a dividend on the ordinary stock in respect of the half year ended June 30 of 2½ per cent. The price of gas was increased from March 18 to 2s. 11d. per 1000 cubic feet; and the Directors hoped that, with the improved condition of the residual market, this increase would enable them to meet the higher cost of coal. The new charging machines had given satisfactory results. The Chairman, in moving the adoption of the report, said he was glad to tell them that there was an increase of 3½ per cent. in the quantity of gas sold. This was very satisfactory, considering the limitations of outside illumination, the shortening of hours in licensed premises, and diminution of excursion facilities for visitors to Chester, thus reducing the demand for gas for catering. Residuals were less by £1000, due to the low prices of coke and tar. They were benefiting slightly from tar, by having adapted their manufacturing processes so as to allow the distiller to secure a larger yield of toluol from the tar they made. This had been done generally in gas-works over the country. The net result of the six months' work was that there was a balance of £3206 to transfer to profit and loss account, to which account they had also transferred £2250 from the reserve fund. They had also written-down the value of Consols to the official minimum price of 65. This had involved a reduction of the reserve fund by £1491, leaving it at £9864. The report was adopted.

◆

Patent Lighting Company, Limited.—A Company has just been registered under this title, with a nominal capital of £100 in £1 shares, to carry on the business of manufacturers of appliances connected with the lighting or heating (by gas, electricity, or otherwise) or ventilating of railway carriages, &c. The first four Directors are named; the qualification being £10, and the remuneration £1050 to £1550 per annum (according to dividends), divided between them. The Board of Trade have authorized the acquisition by the Company of the undertakings of Pintsch's Patent Lighting Company, Limited, and Pintsch's Electric Manufacturing Company, Limited.

Northampton Gas Company.—At the annual meeting of the Company, the Chairman (Mr. C. Markham) said that they had had a very successful year, especially in view of the troubled conditions. One-third of the employees were now serving with the forces, which made it rather difficult to carry out the work expeditiously. The vertical retorts, which were now in full operation, had effected a big saving. The Directors' report stated that the total net profit for distribution, after payment of debenture interest, was £14,199. An interim dividend at the rate of 5 per cent. per annum, amounting to £6325, had been paid, leaving an available balance of £7874. The Directors recommended the payment of a dividend for the half year on the consolidated stock at the rate of 5 per cent. per annum (the maximum allowed); the two dividends amounting, less income-tax, to £12,578, leaving a balance of £1621 to be carried forward. A vote of thanks was acknowledged by the Manager (Major G. S. Eunson); and regret was expressed at the absence of the Secretary (Mr. C. H. Batten) through illness.

Bolton Gas Committee and Higher Coal Contracts.—At the last meeting of the Bolton Town Council, attention was called to the acceptance by the Gas Committee of coal contracts for the next twelve months. It was stated that the Committee had had to pay from 5s. to 6s. 3d. per ton more than last year's rates. This foreshadowed a decreased contribution from the gas department in aid of the rates, although some provision for the advance was made by increasing the price by 5d. per 1000 cubic feet—see "JOURNAL," June 8, p. 599.

Dorchester Gas Company, Limited.—The report submitted to the shareholders at the meeting last week, which dealt with the six months ended June 30, stated that, since the last meeting, the Directors had been compelled, owing to the increased cost of coal and labour, to increase the price of gas 4d. per 1000 cubic feet; and it was hoped that a further advance would not be necessary. The consumption of gas showed a decrease as compared with the corresponding period of last year, which was due to the enforced reduced public and private lighting. In consequence of the depreciation of the Company's investments, a considerable sum had been written-off the various securities. Under these circumstances, the Directors recommended that a dividend of 8 per cent. (less income-tax) be declared on the ordinary shares, and 6 per cent. on the preference shares.

Croydon Gas Company.—At the half-yearly meeting of the Company next Friday, the Directors will report that the sales of gas for the six months ended June 30 exceeded those of the corresponding period of 1914 by 0·35 per cent. The number of consumers increased in the half year by 435; that of stoves on hire is greater by 1107 cookers and 328 fires, while 99 and 194 respectively have been sold to consumers, representing a total increase in gas stoves for the half year of 1728. In March last, the Directors, having in view the large increase in cost of coal and residuals, raised the price of gas 3d. per 1000 cubic feet from and after the date of recording the March meter-indices. In March, £25,000 of "D" stock was issued by tender, on satisfactory terms. The tank for the new gasholder has been completed, and progress is being made with the erection of the holder. Up to this date, 211 employees of the Company have enlisted, or been called up for service, with His Majesty's Forces. The Directors have with great regret to inform the proprietors of the death, on June 10, of Mr. J. C. Benwell, who had for over 37 years been an Auditor of the Company. The meeting will be called upon to elect a successor; and Mr. F. S. Sloman, A.C.A., partner of the late Mr. Benwell, being duly qualified, has intimated his intention of offering himself as a candidate. After providing for all fixed charges, there remains available for division a balance of £34,519; and the Directors recommend that dividends for the half year be declared at the rates per annum of 14½ per cent. on the "A" stock, 11½ per cent. on the "B" and "C" stocks, 5 per cent. on the "D" stock, and 10 per cent. on the "E" stock—all less income-tax. The dividends will absorb the sum of £23,790, leaving a balance of £10,728 to be carried to the next account.

The Lurgan Urban District Council have now empowered the Gas and Electric Lighting Committee to negotiate for the raising of the £47,000 required for the purchase of the gas-works.

According to the "Ironmonger," the Sheffield Gas Company are advertising sets consisting of an incandescent burner, mantle, and chimney, at from 1s. to 1s. 6d. each set, brackets from 6d., and pendants from 2s. each.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ENGINEER, MANAGER, AND SECRETARY. (North Yorkshire.) Applications by Aug. 31, to "Chairman," c/o J. W. R. Punch and Robson, Middlesbrough.

WORKS CHEMISTS. Birmingham Gas Department.

FOREMAN FITTER. No. 6078.

Meeting.

HORNSEY GAS COMPANY. No. 5, Great Winchester Street, E.C. Aug. 27. 3.30 o'clock.

TENDERS FOR

Coal.

LIVERPOOL GAS COMPANY. Tenders by Sept. 1.

PENRITH URBAN DISTRICT COUNCIL. Tenders by Aug. 31.

RAMSGATE CORPORATION. Tenders by Aug. 24.

General Stores (Glass, Lead, Valves, Iron and Steel, Lime, Cocks, Oil, Shovels, Brooms, &c.).

BRADFORD GAS DEPARTMENT. Tenders by Aug. 30.

PLYMOUTH CORPORATION. Tenders by Sept. 2.

Lamps, &c.

BRADFORD GAS DEPARTMENT. Tenders by Aug. 30.

Meters.

BRADFORD GAS DEPARTMENT. Tenders by Aug. 30.

Pipes, &c.

BRADFORD GAS DEPARTMENT. Tenders by Aug. 30.

PLYMOUTH CORPORATION. Tenders by Sept. 2.

Sluice Valves, &c.

PLYMOUTH CORPORATION. Tenders by Sept. 2.

Sulphuric Acid.

PETERBOROUGH GAS COMPANY.

Tar and Liquor.

ASHBORNE GAS DEPARTMENT. Tenders by Sept. 4.

BARNOLDSWICK URBAN DISTRICT COUNCIL. Tender by Aug. 31

BRADFORD GAS DEPARTMENT Tenders by Aug. 30.

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXXI., No. 2728.] TUESDAY, AUGUST 24, 1915. [67TH YEAR.

EDITORIAL NOTES.

The Coal Industry's Distaste for This and That.

THE coal-mining industry does not like statutory regulation; and some of its units now feel like kicking themselves for the extraordinary fondness developed by them for self-interest during the first nine months of the war, and for the fairly widespread disregard for covenants which prevailed, and which put many good customers in tight corners. Now they seem to think that the Government are not so serious over the coal-price regulating legislation as they professed to be; that what is now law has only been passed with the view of producing some moral suasion; and that, as long as the coal people are temperate, the Board of Trade will wink at little evasions. This seems to be something about the opinion of the "Iron and Coal Trades Review," and of not an inconsiderable section of coal traders. The straws at which the latter are now grasping appear to be as weakly as any that ever sprang out of the earth. It transpires that the President of the Board of Trade met a deputation of coal traders; and they took away with them an expression of view on the part of Mr. Runciman that, "provided only a moderate "profit was made, no anxiety need be felt as to the operation "of the Act." The "Review" admits that this is rather a frail reed, but administers a little salve when it says that, "while it is the avowed purpose of the Government to "punish a flagrant and unreasonable violation of the law, it "was not the intention of the Legislature that either collieries "or anyone else engaged in the trade should be forced by "Act of Parliament to do business at a loss." Then our contemporary goes on to say that the Act is intended simply to steady prices, and to prevent huge profits; and, in view of Mr. Runciman's significant hint, it is thought that, so long as the spirit of the Act is observed, the letter will not be insisted upon too harshly. Moreover, the Act itself says that a person coming within its scope shall not be subject to fine if he can show that he had reasonable grounds for believing that he was not committing an offence. The excuses that will be put forward as "reasonable grounds" will no doubt be many, various, and amusing. However, in these ways the speakers and writers for the coal industry are trying to spread some comfort by saying that the Act is not exactly what it seems, that it is elastic, and that it is not so severely disciplinarian as was at first supposed. It would never do for Parliament to allow the idea to prevail that any of their enactments are not serious and effective instruments. If the Act gave the coal people scope for deliberately evading its provisions, it is clear from the coal history of the past few months that Parliament would soon have to pass an amending measure.

There is confidence, too, that the operations of the Coal Exports Regulation Committee do not meet with the entire approval of the coal industry. The Committee, at the beginning of their work, had a rare tussle with those who desired to secure licences for shipments without full inquiry, and who piteously pleaded delay and loss. Had the Committee not been firm, the result would only have meant confusion of the working of the newly-instituted machinery. The Committee gained the day; and so benefited the coal reserves in the country in remarkably quick time. But there are still ambiguous references to the manner in which the work of the Committee is being carried on. It would almost seem that the coal interests are hinting at a want of "discretion" on the part of the Committee. With liberty curtailed, it is perhaps natural there should be a little snarling. But it would be distinctly more diplomatic to make the best of the situation, and endeavour to loyally help the Government appointed machinery to effect the purposes in view. The "Iron and Coal Trades Review" tells its readers that the position of collieries in exporting centres is complicated by the licence regulations, which, unless they are worked with much "discretion," seem likely to defeat one of the objects the Government have in view—by causing stoppages at pits mainly dependent upon the shipping trade, and so reducing output instead of increasing it. If this is not an oblique suggestion that discretion has not been altogether a feature of the working of the export regulations, then we are dense in interpreting the meaning of words.

As to collieries stopping production, there need be no fear of them doing this on the ground of absence of a market for the output. Really, the most singular and illogical arguments are bred and distributed in the coal industry. One day an effort is made to ram the violated "law" of supply and demand down one's throat—the supply, it is pointed out, is curtailed (which is true) because of the absence of miners; hence the higher prices charged at home. This is one argument. Then when exports are regulated, it is said that some collieries will have to shut down, although, before the advent of export restrictions, the country was crying out for coal, and asking that steps should be taken to fill the void—the while the coalowners and traders were pushing up prices to a degree that threatened industry, and caused householders (the poor especially) to hesitate to purchase, and to use coal sparingly. Truly there does not appear to be any sequence in the arguments of the coal interests. Let them reflect. Before the coal export regulating machinery was put into motion, the "law" of supply and demand came into play in this country, because there was an insufficiency of coal output. Therefore, there was here a good margin of absorptive power for coal, combined with which provision has to be made for giving France a supply double that demanded before the war. The case for collieries closing-down does not seem to be a very strong one. It is really a case for trying to get the authorities to increase the exports, which would mean a repetition of the pinch at home, and the maintenance of maximum possible prices, with higher profits on the exported coal.

Talking of exports, a strange story is told as to the control of the coal exported to Holland. The "Iron and Coal Trades "Review" is the authority. It was well known that the Dutch Government at the beginning of the war created a Coal Control Committee, called the Kolenbureau in Utrecht, with the view to the prevention of all speculation in coal. The composition of this Committee, and its location in the premises of the Dutch branch of the German Coal Syndicate, indicate the nationality of the control that is placed upon coal entry in Holland. Any coal not consigned in the first place to the Kolenbureau is seized by the Dutch Government, and put at the disposal of the Kolenbureau. The "Review" points out that the result of this is that the German Coal Syndicate have in their hands the disposal of any coal imported into Holland; and in this way they are in the position to deliver to their regular customers British coal at the expense of those merchants who prefer a separate commercial existence rather than be at the beck and call of the Westphalian Coal Syndicate. "The practical effect of this is that the German Coal Syndicate, "who are the only competitor of British coal in the Dutch "market in ordinary times, are now using British coal for "their special customers, leaving others simply in the "cold." The Teutonic idea of freedom is the concentration of control—from the smallest to the greatest of the world's affairs—in German hands. How the Dutch Government came in this way to put the coal supply of their country under the power of the German Syndicate is a matter we are not going to attempt to try to fathom.

The only other two coal questions that have prominently engaged attention during the past week are the proposed suspension of the Eight Hours Act, and the attempted settlement of the lines of the new agreement between the South Wales coal miners and owners, under the arrangement, entered into recently, which secured the return of the men to work. This is a matter that requires much delicate handling. The same with the suggested suspension of the

Eight Hours Act. Regarding this, there is great variation of opinion in different coal-mining districts; and in some it is feared that any disturbance of existing conditions through the suspension of the Act would have the contrary effect to that intended—the increase of the coal output. If (we get tired of writing "if" in this connection) the miners would only put their backs into the work and give full time to it, instead of the absentees on some days of the week amounting to 20 and 30 per cent., there would be no occasion to suspend the Act in order to get all the coal required. This could be done if the men only made up their minds to do it. It is only fair to say that there are districts in which the miners have shown that they are fully alive to the needs of the country; and the Board of Trade labour statistics also indicate that there is better time-keeping now than formerly in some of the areas. If the remainder of the men could be won over to see that their part in the war is coal-getting, and to the extent needed, it would be better than causing irritation by the suspension of the Act, though we cannot see that suspension, with complete re-establishment at the end of the war, would be in any wise to the men's detriment. However, there is obviously one way that is better than the other in the circumstances; and nothing should be left undone to secure the utmost effect from it. Good effect has already resulted from direct appeals to the miners, who are not all eligible, as some people (with interests to serve) would have us believe, for inclusion in a class of recalcitrants and addled heads altogether beyond hope. This question of the suspension of the Act is also one on which more will be heard. The Coal Organization Committee have been discussing the matter; and they have now convened a conference of those primarily concerned in it.

The Foolishness of Interrupting Business in Gas-Heating Appliances.

Some time ago the coal merchants of London made an attack upon the use of gas as a fuel in the vain attempt to stop its progress—a progress that they found was inconveniently eating into their household coal business. Their efforts bore no fruit, any more than did the command of dear old Canute to the waves to cease their rolling. The waves paid no heed to the regal voice; and the public have paid no heed to the voice of the coal merchants. Gas fire and cooker connections continue to be made; and now the coal merchants, or rather the less reputable of them, have done a good turn to gas undertakings by opening their mouths a little too widely during the war. While high prices ruled last winter for household coal, gas-fires and other gas-heating apparatus were in some districts going in as freely as ever; and, in the case of one company of which we have information, the number of heating appliances fixed during the past half year about equalled the record for a June six months, and this without any special effort. Speaking at the meeting of the Wandsworth, Wimbledon, and Epsom District Gas Company (reported elsewhere to-day), Mr. H. E. Jones called attention to their experience. Last half year, the Company did very well in new heating connections; so much so that the capital expenditure on meters and stoves amounted to £8514. He puts this down as much to the influence of the advance in householders' coal bills as to normal growth. In all probability, too, some part of it may be traced to the increasing shortage of domestic servants, owing to the several other opportunities now open to them for earning good money and having more leisure. Labour-saving appliances must be adopted to meet the decline in the supply of domestic servants; and gas-cookers and gas-fires are excellent labour economizers. There are good reasons here why the opportunity should be taken of impressing on householders—if they desire to, at any rate, partly relieve themselves of the coal trouble, to have the comfort of gas-fires during next winter, and enjoy their aid in saving labour—the necessity for getting the fires installed early for the winter season in view of the scarcity of gas-fitters.

A striking remark made by Mr. Jones, when speaking of the expenditure of capital upon new stoves, was that it would have been a very foolish thing indeed if, although money was dear, the Company had refused the applications for gas-heating appliances. We agree with him; for this is an exceptionally good time to introduce gas-heating appliances to householders who perhaps have declined to look at them before. Moreover, we are no believers in a progressive industry such as that of gas supply making a break in its work in those newer parts of business the development of which—as much, and as fast, as possible—is vital to continuous prosperity. No excuse ought to be allowed to prevail in the matter; and no gas undertaking we hope has been foolish enough to shut-down any branch of business. As surely as this was done, so surely would a vast amount of injury be occasioned to the exploitation work of the past; and the discontinuity would create an immense lag when it was desired to resume the business. Meantime some possible consumers of gas for heating purposes might, to the gratification of the central station engineers, become patrons of electricity for heating purposes. It does not do to let people get and harbour the idea that one does not want business of any kind within the boundaries of utility of the product offered, or that there is any incapacity to meet demand. Both would be false impressions in respect of the gas industry. But, whether false or not, it is better and safer that the idea should not get a footing; for as surely as it does, it will gain ground. We therefore hope that there will be no lack of energy, to the extent of capacity to execute orders, in developing the business in gas-consuming appliances, especially under the popular—and paying—hiring-out system.

The excellent point made by Mr. Jones as to the foolishness of refusing to hire-out heating appliances, notwithstanding that money is dear, so as to maintain a continuity of the development of this business, is unconsciously accentuated by the temporary financial position of the Wandsworth Company. The Company are in a strong situation in regard to the selling price of gas. The initial figure to ordinary consumers has been 1s. 9d.; but the price was put up 4d. last quarter. Even then the initial charge is only 2s. 1d. This price is in itself a good reserve. But capital is dear, the disposable balance on revenue account is temporarily *nil*, and the "gilt-edged" securities in which the reserve and other funds are placed could only be sold at the present time at considerable loss on cost. Yet, said Mr. Jones, it would have been a very foolish thing indeed to have refused these applications for gas-stoves and other heating apparatus. Those concerns that are not at the present time pushing business owing to the dearness of money should reconsider the question from the point of view of lost opportunity and the damage that must ensue from interruption of business and from a sudden cessation of those methods of cultivation that were previously applied. Whatever may have been the views that in this regard had possession of some gas administrators at the beginning of the war, there is certainly no possible room for them now. The dearness of money is an established fact. But it must not be forgotten that money is going to be dear for a very long time; and surely it is not contemplated that business development is to be delayed until in the distant future—a future the conditions of which are beyond our horizon to-day—things get easier. Gas undertakings with administrations holding any such opinions are to be pitied; and those undertakings should be avoided as suitable quarters in which to invest fresh capital. There is another point to be considered. The capital investment on gas appliances for hiring-out is usually very profitable; the rentals being, as a rule, amply sufficient to cover interest, depreciation, repair, and all charges. Therefore, there is no excuse on this score for preferring a lapse rather than a continuity of business in the hiring-out of apparatus. The Government authorities, too, are fully alive to the work that the gas industry is doing in connection with the war; and it may be taken that the Treasury will not look unfavourably upon granting their approval to the raising of capital for an industry which the more it is developed the greater it can render aid to the country in providing several essential requirements to the production of a lasting peace.

There is another side to the financial position of the question under consideration. The trading condition of the gas industry has fairly well settled down under war conditions. We now know the worst in regard to coal. Rates of freight for those companies that have not their own ships are the source of greatest obscurity. The residual products are not doing at all badly. Gradually the loss of gas consumption is being reduced. The price of gas has been raised; and a less sum is required for dividend and interest on capital, owing to the increase in the price of gas. On the other hand, certain new charges have come upon most concerns, due to the war. Already through the increase in the price of gas, there are signs of some undertakings increasing their carry-forward, and so consolidating their position. There are some chairmen, too, who are talking of the prospect of the increases in price of gas being of short duration. Better by far will it be, for consumers and proprietors alike, if the price of gas is maintained sufficiently for a period to provide the necessary funds for maintaining as high as possible the level of development of the use of gas-consuming appliances. It is up to all gas administrators to ensure that the future of the undertakings the interests of which are their charge shall suffer as slightly as possible from the ill-bred and uncouth circumstances of the present. The effects of these circumstances must be in proportion to the energy expended and the methods employed in lightening them. Where there is lethargy and neglect, there, of course, the whole weight of effect must be brought upon the concern to its disadvantage—present and future. The use of gas for heating in the domestic and industrial realms is, we believe, going to far outstrip in volume the consumption of gas for any other single purpose; and therefore it is our opinion that no excuse should be allowed to weigh against development. While saying this, it would almost seem, looking at our advertisement columns the last two or three weeks, that some of the firms doing business in gas-heating apparatus have taken it into their heads temporarily to hide themselves; yet they have also an interest in promoting an unbroken continuity of the gas-heating business, which applies to summer as well as to winter.

Signs of Higher Freightages.

The rate of freightage from the Tyne to London has continued at 7s. to 7s. 6d. for some time now, or at rather more than half the rate that intermittently existed with other extravagant figures at the latter part of last year and during the earlier months of this year, and over twice as much as the rate prevailing prior to the war. The influences that caused the rate to recede are the bringing into the market of a number of interned vessels, the coming into operation of the Coal Exports Regulation Committee (which set free a part of the inordinate number of vessels that were carrying on an unusual coal traffic with neutral countries in close touch with Germany), the coming of the lighter months of the year, and the fact that some of the larger charterers of vessels found in the high rates of freight an incontrovertible reason for becoming shipowners on their own account. But now, if we read correctly between the lines of an article that has appeared in the "Newcastle Daily Chronicle," the way is being paved for another upward movement of freights. It is mentioned that we are now nearing the period when the overseas carriage of the great crops will influence the freight market, and that at the present time this influence may be increased because the tonnage of commercial vessels is not being added to, as has been customary of late years. It is also pointed out that while high freights may have a tendency, together with the dangers of the seas, to check overseas shipments, the needs of the nation will be as considerable as ever for corn, cotton, &c., and probably there will be importation from longer distances. In another part of the article, there is reference to higher charges for fuel, wages, and insurance, and to the delays at ports of loading and discharge, and *en route*.

What does all this portend, if not to prepare the way for advances in the rates of freight to figures, which, in view of the height of existing rates, will be highly extortionate? The shipowners ought to take a lesson from what has happened to the coalowners in respect of the regulation of coal prices; and the determination of the Government that they will not allow the whole community to suffer unduly in order to enrich, through any immoderate charges, a comparatively small section. The string of high costs due to the war has been played upon long enough by the shipowners. Higher costs are admitted; but they are a measurable quantity. The Gas Light and Coke Company have shown that, including interest and depreciation, the cost last half year of bringing coal by their own ships from the Tyne to London ranged from 4s. 4d. to 3s. 2d. per ton; while the average increase of the Commercial Gas Company was 1s. 4d. per ton more than in the corresponding half of last year (this including a steamer hired at the market rate of freight). The Wandsworth Gas Company, too, by their own vessels, brought coal to London last half year at 4s. per ton. There is therefore a good margin of profit in the 7s. to 7s. 6d. now being charged, without finding fresh excuses for further raising the rates. The "Newcastle Daily Chronicle" thinks that "the results of the better freights that have been known "now for about a year must, on the whole, have been satis- "factory to the shipowners," which is an extraordinarily clever and original thought, modestly put. The modesty is emphasized by the further remark that the market values of the shares of some of the cargo-carrying companies have risen by from 40 to 50 per cent.; while, through the reduction of passenger traffic, the stocks of certain of the great liner companies have fallen from 10 to 15 per cent. The shipowners, like the coalowners, appear to be an easily tempted race of men; and patriotism?—well, with them business is business, and their patriotism must find expression in some form that does not interfere with money-making.

Road Authorities and Pipe Owners.

We have the promised article [see *ante*, p. 133] by Mr. Reginald Brown, M.Inst.C.E., on the subject of the improvement of the relations between road authorities and those who have, for the purpose of public service, to use the subsoil of roadways for the accommodation of their means of distribution. It is a laudable object that our contributor has in view; and therefore we confidently ask for a studious consideration and discussion of the case he presents. If all road authorities took the same conciliatory and fair attitude as Mr. Brown, all would be well. It should be so, because if two bodies have mutual obligations which have a common end, they are the local authority whose business it is (among other things) to maintain the roads for the advantage of the locality, and the company who—also for the convenience and the advantage of the locality, and for limited reward in the way of profit—take upon themselves the supply of gas or water. Any locality unfortunate enough to be without these conveniences and advantages—without good roads and without the public services gas and water companies provide—would not be in the position to develop the same as other districts.

In this connection, we may at once dispose of a point made by our contributor. He deals with the views as to the rights and obligations of those who use the subsoil of roads, and of those who have to make and maintain the roads in sound state. He admits that the pipe owners are large ratepayers; but, in doing so, he asserts that one of the arguments of such owners is that: "We pay our share "of rates to the other services of the local authority, and "get no value, direct or indirect, from doing so." We were not aware that any gas company adopted such a foolish attitude, so long as their assessment is fair, rates reasonable, and the money devoted to good purposes of local maintenance and improvement. The part of the rates to which gas companies have objection is that which represents extravagance, and that which is required for the maintenance of pauper electricity undertakings—undertakings municipally carried on in such a way that competition with private enterprise is altogether unfair. But they have no objection to rates spent on real improvements which will add to the attractions of, and so help to develop, the district residentially, industrially, and commercially. To so object would be to oppose the upkeep and expansion of their own scope for business; and from such upkeep and expansion they do derive a very direct advantage. On the other hand, there is a direct value to a local authority from the presence of such concerns, quite apart from their contributions to the local exchequer. Gas undertakings especially are good employers of labour; but above all they and their cognates, by providing local conveniences, subscribe to the development and therefore rateable value of a locality, and, the lower the price at which they can render the service, the greater the popularity of a district. Therefore it is a wrong idea to look at this question of road openings, reinstatements, and maintenance from the narrow point of view that the companies are makers of profits—limited ones in the case of gas and water. That roads have to be broken up is a condition inseparable from the provision of something locally necessary, and as much an essential in the local machinery and the local advancement as the provision and maintenance of good roads. The very nature, and the statutory control, of gas, electricity, and water supplies set them above ordinary business ventures, but local governing bodies (when not themselves the undertakers) have in many cases developed the bad habit of looking upon those who engage in these supplies as merely speculative intruders to be bled to the uttermost penny, and harassed with perseverance, although often the largest ratepayers in an urban area.

Encouraged should be a better mutual understanding between road authorities and those who have to carry on their work of distribution by subterranean means; but it is very necessary to the understanding that both parties should first get into proper focus the relative positions of the one and the other, in order to appreciate that their respective work is essential to the district. Mr. Brown tells us that road authorities feel very "sore" on the point as to road openings. These openings are absolutely necessary; the time of making them is another matter. We are bound to say there are companies who are blameworthy in respect of inopportune work; but, on the other hand, there are road authorities and district surveyors—some of the latter are sticklers for red tape and obsequious respect—who are also blameworthy. Give and take! Some road authorities and district surveyors expect gas and other companies to do all the giving. Perhaps Mr. Brown has not seen a side of this matter that pipe owners see—not, thank goodness, in all districts, but in many of them. "Municipal engineers," he writes, "should notify the companies of any intention to " extensively repair or pave a road, so that the latter may " attend to any known defects in their mains, or expedite " the laying of new mains should any be required at a " comparatively early date." This is precisely what some municipal engineers do not do; or rather the notice given is sometimes so inadequate that there is no time, before the road men are well on with their work, for an engineer to get the necessary authorization from his Board, to make the needful testing of the pipes, and to plan for the work to be carried out. We quite agree that in a good many towns the procedure advocated by Mr. Brown is followed with " mutual advantage to both companies and road authori- " ties." What is found good in those towns should surely be common practice. This is one way in which there might be improvement, with resulting efficiency and economy.

Small openings for service laying cause much trouble; and gas companies are impeached by Mr. Brown with being the biggest culprits in this respect, especially since the introduction of the prepayment meter system. The frequency, however, is wearing down. Were it not, it can be claimed that one of the best pieces of work the gas industry has done for every locality has been in the working-class districts (which are not usually the best from the road condition point of view), for prepayment meters have improved the home and cooking conditions of the poorer people, and relieved the atmosphere of a large part of the domestic smoke. Whatever injury has been done to roads and pavements by this work has been more than compensated for in other ways. Of course, an opening of some kind must be made in order to connect services; but, where possible, we do not see the slightest objection to the "drawing-in" system being adopted under tar-paved and such-like paths. But this is not possible where, through the character of the soils or possible electrolytic action, service-pipes require special protection around them in order to prevent rapid deterioration.

Passing by the matters in the article of especial concern to water engineers, we think that Mr. Brown is too general in his charge that gas and water companies do not, as a rule, employ men skilled in road making, but men who are merely mainlayers. In the areas of the larger concerns, the regular men know the district well, and the nature of the roads; the local authorities who deal with foundations and the upper crust, and consolidation by steam-rollers, cannot produce men more capable in trench and refilling work. Many companies, too, employ contractors whose men have experience the country through. At the head of a company's gang of mainlayers is usually the man who has had the longest practical experience of the work, or has shown exceptional intelligence and aptitude; and, in well-ordered companies, inspection of the work in progress is frequently made by the engineer or district superintendent. It is rather a narrow view that "the general superintendence by " the company is for the purpose of the company, and for " which they get a monetary return; the general superin- " tendence by the road authority is for the purpose of the " general public, and for which they get no monetary " return." But if the rest of Mr. Brown's article means anything, the road authority would gain very considerably in economy by giving sufficient supervision to these matters —and economy is synonymous with monetary return. Thus it seems to us that, at any rate with the larger companies, Mr. Brown's suggestion is already complied with, that they should employ men who are not only skilled in mainlaying, but also in road repairs. Our contributor repeats his advocacy of the use of mechanical rammers; and he sees no objection to local authorities providing the rammers, and a man to work them—the company paying certain charges. But we are afraid that it would not be a practicable proceeding for the local authority to have one or more men to assist the company's men in their mainlaying operations, and be responsible to the road authority for proper reinstatement—the cost of these men being borne by the company. Who would be the master of these provided men? and to whose instructions would they work? In connection with the Metropolitan Water Board Act this session, an attempt was made to get the filling-in clauses of the Metropolis Management Act applied to the new aqueduct the Board are constructing; but nothing more than surface reinstatement was allowed to the local authorities.

The idea of our contributor is that mutual interest should promote better relations. His article is a friendly essay to this end, and as such should be encouraged. He gives us a reasoned argument, and a number of suggestions. But how different this all is from the efforts of powerful road authorities to squeeze from companies new powers of a one-sided character, which, if not conceded out of Parliament, mean heavy expenses in meeting their opposition in the Committee rooms. In the main, however, Parliament has refused to give the road authorities more than is reasonable and their common law rights. Their excessive claims do not lie in the same road as the proposals made by Mr. Brown, in his article now under notice, to secure greater efficiency in the execution of necessary work.

Adventitious Consumption.

There were some remarks in the speech of Mr. Charles Hussey, J.P., to the proprietors of the Croydon Gas Company on Friday, with which one can agree in the presence of the circumstance of the maintenance last half year of the gas consumption, as in the case of the Company over which he presides. He was speaking of the consumption of gas, and pointed out that, while the Company had had a slight increase in the half year, they had had little or no output of gas for special war purposes. Then he added that he was not sure that a largely increased sale of gas at the present time, if due to special consumption for military purposes, was to be desired, owing to the fact that, while a source of revenue, it involved a heavy strain on the productive side of the undertaking at a time when the steps thereby necessitated were both costly and difficult. Quite true when the consumption merely means a large temporary increase. But there are many gas undertakings which would have suffered considerably more than they have done had they not had, during this war time, a good amount of special consumption with which to help to fill the "aching void" in their business. There are gas concerns situated in districts where public and shop lighting and certain of the local industries have been so much affected that there would have been a large volume of business short of the normal, if it had not been for the special consumption. If the war-promoted extraordinary business in gas supply could have been allotted to areas according to the effect that the war has had upon normal gas consumption, we could name a few gas companies that would have held up their hands for the favour of special consideration, and glad of the opportunity.

Gas-Oil Imports.

Bearing on the recent remarks of Sir Corbet Woodall, that, unless the Admiralty can do something to relieve the situation, there might be trouble over the supply of gas oil, through the shortage of tank-steamers, we see from the returns published in the "Petroleum Review" that the total imports of gas oil from Jan. 1 to Aug. 2 amounted to 51,737,350 gallons. Of this quantity, 1,370,000 gallons were Mexican; and the whole of the remainder came from U.S.A. The Gaslight and Coke Company last half year alone used no less than 11,675,747 gallons. With such a figure, and knowing from the Board of Trade returns something as to the quantity of oil normally required for carburetted water-gas manufacture (which will be greatly increased in times when coal is as dear as last half year and at present), the supply does not appear to err on the side of amplitude; although it stands well in comparison with the total import of gas oil in the whole year of 1914, when it was rather more than 79 million gallons. The price of gas oil in bulk is quoted by our contemporary at 4½d. per gallon, *ex* wharf.

The Exports of To-Morrow.

The problems of national income and expenditure have lately been put before the country in a style which suggests that the whole matter is of a very complex nature, and not the subject of certain plain and almost homely economic laws—such as that, for the balance to be on the right side, exports should exceed imports, just as income should exceed expenditure. Mr. W. H. Cowan, M.P., one of the Directors of Messrs. Parkinson and W. & B. Cowan, has written an article in the "Daily Telegraph" in which he puts the position in a delightfully simple way, so that all who read may understand. Exposition, however, is not the main intention of the article; it is to emphasize the fact that the nation's position of economic advantage depends on its capacity for increasing export trade, and to make certain suggestions, as Mr. Cowan is well able to do, having had part of his training in the practical world of manufacture and commerce. As a nation, he points out, it is impossible for us at the present time to decrease our expenditure; and so we can only enlarge our national income by increasing the amount of goods which we sell over the seas. An excess of imports over exports for any protracted period under the abnormal conditions now prevailing, means a constant and serious drain on the gold reserves of the country. Mr. Cowan therefore urges the manufacturers—and there are thousands of them—who are not concerned in munitions work to, after satisfying internal necessities, devote their attention to export trade more than ever before; for, by so doing, they will be serving the best interests of the country. He admits that in certain trades, war conditions may have so far limited the possibilities for exportation as to render any hope of increasing it futile. This, however, need not preclude the heads of businesses to-day considering the question with a view to the conditions of to-morrow. It is essential that it should be realized at once by those business men who have not in the past grasped to the full their opportunities for overseas trade, that it is their patriotic duty, as much as their private interest, to realize these opportunities, and seize them more readily and completely than they have done before.

The Rivalry of Gas and Steam.

There is always danger in being a prophet. Sir Frederick Bramwell essayed the *rôle* once. It has never been forgotten against him. By 1931, steam-engines were, in his view, to be relegated to museums, owing to their displacement from practical work by gas-engines. "Engineering" has been inquiring how far the prediction has come true, or rather how definite are the signs that it will be fulfilled. There are a few more years to roll before 1931, and who knows that the gas-turbine may not by then be an accomplished fact? We are not going to say that it will not be, though appearances are against it. When the prediction was made, the gas-engine could give 1 indicated horse power hour from 12,000 B.Th.U., whereas the steam-engine required 15,000 B.Th.U. per indicated horse power hour. Then came Parsons' steam-turbine, and gave steam a new lease of life, and an unrivalled efficiency for large powers. Our contemporary does not see any room for material improvement in the gas-engine, whereas the margin for the utilization of steam is still substantial. Admitting the truth of the latter statement, the lesson afforded by Sir Frederick Bramwell's prophecy should cause statements to be guarded regarding the future of the internal combustion engine. Of course, our contemporary has to admit that, in the case of small power plants—and these are more in demand than mammoth ones—the internal combustion engine is very much superior to its steam-driven rival. A 60-horse power gas-engine gives about as good an efficiency as one twenty times as large; while a 60-horse power steam-turbine is invariably a steam eater. It is only when the output is large that steam begins to hold its own. Much, of course, depends upon the load. Comparing gas-producers and steam-boilers, stand-by losses are much less with the former than the latter; and hence when work is intermittent, the gas-engine gains accordingly. For ordinary purposes, the range of utility and convenience of the gas-engine is greater than that of any steam-driven plant. Fuel is at the present time dear for steam purposes; and while our contemporary does not assert that solid fuels can compete with the net cost of producer gas (with bye-products recovery), it seems inclined to consider the application of the gas under steam-boilers and the use of steam-turbines, rather than putting the gas into the cylinder of an internal combustion engine for the direct production of work. The appropriateness of this depends on the size of the plant, the work to be done, and the heat losses that there are between the combustion of the gas and the utilization of the steam in the turbine.

The Fallen and the Disabled.

The exhortation to take no thought of the morrow does not apply to the major part of temporal things in these times. If Great Britain had not taken thought of the morrow when determining the rate of the growth in the strength of her Navy and in promoting its efficiency, we should to-day have been writhing under the heel of the vilest tyranny ever created by man. Had thought not been taken for the morrow's coal and oil supplies of the gas industry, an important public service would have been largely at the mercy of those who were animated by the sordid desire to get their "full pound of flesh" in the form of profit out of the circumstances existing solely through the war. There are many things arising from the war and associated with the future to which thought must be given. There are the dependants of the brave gas workers who make the supreme sacrifice in the cause of the country; there are those of the industry's men who will return home incapacitated, and unable to resume their former work. The staff and workmen of the Manchester Gas Department, looking forward, have started doing their part to make provision for those of their fellows who fall or are disabled. When the war began, the staff and men decided to make regular weekly contributions to the National Relief Fund; and during the year they have done well. But there is not that acute distress in the Manchester area that was anticipated; and the level of employment is good. This being so, it has been decided to now divert contributions to a fund for the benefit of the members of the staff and workmen who are incapacitated in action, or to assist the dependants of the fallen. This is an excellent scheme; and a local correspondent gives to Mr. Fredk. A. Price, the Superintendent of the Department, the credit for originating it.

Comparative Municipal Statistics.

We have received from the Clerk to the London County Council a volume of comparative municipal statistics for the year 1912-13, compiled by the Council from information supplied by the authorities of the several towns and from other sources. The contents of the volume are most interesting and instructive to those engaged in municipal work. One of its main objects is to ascertain whether any economies can be effected by a yearly comparison of the cost of municipal services—in other words, whether any standard of expenditure upon particular services can be laid down, even approximately. It is pointed out that there is a tendency for the cost of nearly all public services to reach a minimum in towns of about 90,000 population, though the services of gas and water tend to decrease in cost as the population of the administrative area increases. A second object of the compilation is to ascertain whether, by comparison, information can be obtained which will tend to the increase of efficiency. For instance, the value is obvious of trustworthy official figures in relation to tramways, the supply of water, gas, and electricity, and in connection with the improvement of health and the elimination of disease. Necessary, too, are comparative municipal statistics in the interest of the reform of local self-government, which, it is admitted, is rapidly becoming chaotic. The statistics are divided into about 39 sections, and include maps and diagrams—the sections embracing water, gas, and electricity. The gas statistics refer to the following municipal undertakings: Birmingham, Manchester, Leeds, Glasgow, Edinburgh, Dundee, Aberdeen, Belfast; and to the following companies: Gas Light and Coke, South Metropolitan, Commercial, Liverpool, Sheffield, Bristol, Newcastle, Cardiff, Swansea, and Dublin. The price of the volume (which is published by Messrs. P. S. King and Son, Limited, of Westminster), is 5s., or 5s. 4d. post free.

In this country, the "Nottingham Express" writes, one is apt to think of natural gas as a mere scientific curiosity of no substantial commercial importance. Some figures that were recently published show, however, that in America the investment in the natural gas industry exceeds £80,000,000, and that the revenue therefrom amounts to nearly £20,000,000. The general use of gas for heating and cooking is largely responsible for these surprising statistics. It is estimated that in American cities the average domestic consumer of artificial gas burns annually 30,000 cubic feet, at a cost of from £5 to £6. But the same heat value can be obtained from 18,000 cubic feet of natural gas at a cost not exceeding 30s. and sometimes as low as 18s. As the supply of natural gas is such excellent business, new deposits are being constantly sought for, especially in the middle of the Continent. It is reported that natural gas and petroleum are more widely distributed than any other mineral product in America.

PERSONAL.

Mr. James Hempton has been appointed Gas and Water Manager under the Newtownstewart (co. Tyrone) Rural District Council.

In this column last Tuesday reference was made to the fact that Lieut. George D. Bidwell had been wounded in the Dardanelles. Later information is to the effect that he has a severe wound in the back, but is progressing satisfactorily. The casualty occurred during the new landing effected in Turkey between the 6th and the 12th inst., when there was a heavy list of casualties, especially among brother officers of Lieut. Bidwell.

OBITUARY.

The "Journal für Gasbeleuchtung" of the 31st ult. reports the death, at the Western battle front, of Herr August Knoke, the Works' Assistant at the Hadersleben Gas, Electricity, and Water Works.

This year's Chairman of the Gas Committee of the Horncastle Urban District Council, Mr. William Gale, died yesterday (Monday) week, at the age of 64. He had lived in Horncastle for forty years, was on the old Local Board, and had been a member of the Urban District Council since its formation.

In the course of their report to the stockholders, the Directors of the Bournemouth Gas and Water Company announce, with regret, the death of Mr. J. C. Benwell, F.C.A., who for 24 years had acted as an Auditor of the Company, as he had also of several gas companies—including Croydon—whose meetings are regularly dealt with in the pages of the "Journal."

The death is announced, as having taken place last Thursday week, of Mr. John Barr, a Managing-Director of Messrs. Glenfield and Kennedy, Limited, and probably one of the best known, one of the most influential, and one of the most highly esteemed citizens of Kilmarnock. Mr. Barr was frequently consulted by water-works engineers of large and important cities before water supply schemes were entered upon; and his advice was always highly valued as that of an experienced and reliable authority. At various times he read papers before Technical Societies with which he was connected.

Last week's Australian mail brought news of the death, on the 8th ult.—after being bedridden for more than two years—of Mr. Daniel Warren, formerly Manager of the Footscray (Victoria) Gas-Works, belonging to the Colonial Gas Association. Deceased was born in England, at Portsmouth, in March, 1832. At an early age he was in the Royal Navy, and served on H.M.S. Himalaya and St. George, and won medals for service in the Crimean war—these bearing clasps endorsed "Baltic," "Crimea," and "Sebastopol." At the conclusion of the fighting, he went to Victoria (in 1856) as a gas-making expert, and was induced to remain as Manager for the Geelong Gas Company. In 1878 he transferred to the Footscray Gas Company, of which he was Managing-Director until four years ago, when, following on the death of his wife, he suffered a breakdown. Deceased was at the time President of the Victorian Gas Managers' Association.

The sad circumstances under which Mr. William Blakey, the Accountant of the Gas Light and Coke Company, met his death last Wednesday are reported in a later column of to-day's issue. In this reference to the tragic event, it is only kind and perfectly true to intimate that the war, with all the extra official work and responsibility which, in common with so many others, it brought to Mr. Blakey, imposed a strain which his nervous, highly-strung temperament was unable to withstand. Needless to remark his accounts were in perfect order. He was a most able man at his work, and enjoyed the esteem and utmost confidence of Directors and colleagues alike. He entered the Company's service some 24 years ago, and succeeded to the post of Chief Accountant on the retirement of Mr. A. Bevis in September, 1912. His illness began some three months ago, when the Directors, realizing the possibility of slow progress, granted him unrestricted leave of absence and other considerations calculated to relieve him of anxiety and accelerate his recovery. He was 42 years old, and leaves a widow and two young children.

Bye-Product Coke-Ovens in Canada.—At the annual meeting of the Canadian Mining Institute, a paper was read by Mr. Walsh, in which it was stated that the total number of coke-ovens in operation in Canada at the commencement of 1914 was 1720, while 1375 were idle at the time. Of these coke-ovens only 730 are of the bye-product recovery type; the remainder being of the beehive pattern. The amount of coke made during 1913 was roughly 1,500,000 tons. The consumption of coke in Canada is much greater than the production. The net imports in 1913 were roughly 650,000 tons, making a total of 2,150,000 tons. If all this coke were made in bye-product ovens in Canada, about 20,000,000 gallons of tar would be produced yearly. As it is, the production is roughly, under normal conditions, about 9,000,000 gallons. The greater cost of installing the bye-product ovens, and the lack of markets for the bye-products, has no doubt hindered their substitution for the non-recovery oven. At the present time in Canada no benzol is produced from the coke-oven gas.

ELECTRICITY SUPPLY MEMORANDA.

Costs on the Up-Grade.

The cost of everything requisite to the electricity industry has gone up—the same as is the case with all other industries. The greater number of electricity supply undertakings, being municipally managed, have for many years been enjoying capital at a fairly low rate of interest. But the palmy days in this respect have gone, and are not likely to return. Dearer money, and dearer things to buy with money, constitute the current position. With the latest Government security paying 4½ per cent., and the Government guaranteeing its safety, municipal authorities cannot expect to get money at a cheaper rate for their trading enterprises. The Treasury have now announced that loans required for local purposes with a repayment period not exceeding thirty years are to bear 4½ per cent. interest, and not exceeding fifty years 4¾ per cent. Regarding the dearer materials that have now to be bought, coal is not the only thing; but the term may be made to include the whole run of necessaries, from plant and cables to the apparatus required for the consumption of electrical energy. Therefore, perhaps, on the whole, it is a good thing that the Local Government Board have to confine sanctions for new loans to work that is indispensable—more especially in connection with the war. Because with the high cost of money and materials, there would be, by present lavish expenditure, a permanent abnormal burden placed on the concern. In cities and towns where the central station engineers have been fortunate in having prior to the war a modern type of generating plant installed, they have had the gratification of finding that, although coal costs per ton have gone up considerably, economies effected in fuel have on the year's account counterbalanced the total increased expenditure on coal. The Norwich electricity undertaking is an example of this. In spite of the fact that the cost of coal last year increased from 16s. to 17s. 4d. per ton, there was an actual saving of £700 on fuel, due to the higher efficiency of the plant. This, however, applies to comparatively few concerns; for there are not many that have had of late large new units of generating plant installed. Moreover, of the total outgoings on an electricity undertaking, fuel represents a relatively small proportion. Capital charges, distribution costs, and other expenditure may run up to 70 to 80 per cent. of the total outgoings; and it is in these directions where in all undertakings, whether blessed or not with high efficiency generating plant, higher costs will bear heavily. Only recently a well-known electrical manufacturing company put up the price of certain of their manufactures by as much as 25 per cent.; and this is not surprising when all things are considered. Electrical apparatus demands expensive material—copper for example—and workmanship.

Copper.

The market price of the last-named material has lately shifted about between £80 and £90 per ton. But the "Electrical Review" is rather hopeful that the growing production—it describes present output as "colossal"—will affect fundamental conditions, and bring down the price. It says that output is rapidly extending in Africa and South America. It confesses, however, that the statistical position of copper in Europe is not much of which to boast; but it thinks the possibilities are that there will be a further increase in available stocks as time goes on. This is a fairly safe prediction, as time is illimitable. It is not known whether the "Review" was able to take into account the copper position in Germany, because "Electrical Engineering" says that, on the authority of an article which appears to have been written with sound information at command, Germany has sufficient copper for her Army requirements "for years." But this tremendous store seems to be made up in curious fashion. The German Government have already taken possession of all stocks of raw and partly manufactured copper; and other potential sources of supply are the stock of manufactured copper in the possession of the public (which is put at 2 million tons); and the copper roofing on public buildings. Registration, too, has been made of all the copper, manufactured or otherwise, held by public undertakings—including electricity concerns. It looks as though the German Government are preparing to strip the country of its copper goods, if stocks of the raw material will not hold out.

Domestic Electrification.

We have been told by politicians and economists in high places that it is necessary for the country's financial well-being to reduce imports as far as possible and to increase exports to the utmost extent. This economic law from all accounts the British manufacturer of electrical apparatus does his best to defy. He makes apparatus which spells ruin to progress in domestic electrification, and compels the electrical engineer to turn to goods produced elsewhere—in America, for example; so increasing imports, and making his own apparatus unattractive not only at home but abroad. No one, of course, would use a piece of electrical apparatus that was now made in Germany, lest, in the causes of "Kultur" and the murdering of babies and women, it concealed a bomb. The attack on British manufacturers of electrical appliances has been revived by Mr. A. C. Bostal, Sales Manager of the Croydon Electricity Department; and the "Electrical Times" has slapped him on the back for being a good and courageous fellow, for coming to the Front, and taking part in trying to arouse British makers of defective electrical appliances to a sense of their duty. In passing, however, he states his opinion that no great progress will be made in domestic electrification, except in such almost negligible things as irons, fans, shaving-pots, and such-like trifles, other than perhaps in the better-class houses, until electricity suppliers are blessed with hiring powers, or are allowed to apply the hire-purchase system. On this matter, it is unquestionably a great drawback to the electricity supply industry that it is so largely dominated by municipal trading, which—as the funds with which speculation is made are public money, and not that of private individuals as in the case of companies—must be kept under control and within limits.

The Case against the Manufacturers. As to the British manufacturers, what Mr. Bostal alleges against them is that to the poor mechanical work put into their appliances is due the great majority of breakdowns; and these mechanical defects, according to his experience, could easily be remedied by care. Mr. Bostal proceeds to compare American work with British—to the disadvantage of the latter. For a number of years, he has been "experimenting" in a large laundry—poor, long-suffering laundry!—to find a satisfactory electric laundry iron loaded to 750 watts. He tried every style of British-made iron which appeared to him to be good; but he could not find a combination of flexible wire, connector, and element which would stand the hard usage required of laundry pressing-irons. Every week, without exception, it was necessary to put something right. We repeat "poor, long-suffering laundry!" However, Mr. Bostal thinks he has now found what he requires in an American production. The American irons are in use now; and for two whole months—note the time!—he has not touched them, the contacts are as clean as new pins, and the flexibles show no signs of fraying. He seems surprised. Fancy no signs of marked deterioration in two months! We hope that the "Electrical Times" has not printed "months" instead of "years." However, speaking generally of British-made electrical apparatus, the critic finds that small lock-nuts are put where inaccessible, and no spanner is capable of gripping them. Bolts are left projecting beyond the nuts. Leading-in wires are run-in in such a way that only the makers can say which is which. This does not exhaust the list of small defects which help to make the burden of the complex electrical life so heavy. Looking at larger things, Mr. Bostal complains that, if a hot-plate breaks down, it is necessary to send it back to the makers; and the expected and realized reply is, that the hot-plate is in a dirty condition, that water has evidently caused the element to collapse, and that the cost of repairing same will be 15s. 6½d. "Poor, deluded user! Were you not told that, under electrical operation, there was nothing to do but to prepare the food, put it into the oven or on the hot-plate, and the electrical apparatus would do the rest without demanding any trouble on your part? Were you not told there was no smell, no dirt, no anything but good results with electrical operation? Were you not told that all your kitchen worries would be ended, and you would be money in pocket?" Yet with a little spilling of water there is a breakdown, a hot-plate is unusable, the apparatus cannot be run again until repaired, and bang goes 15s. 6½d. to provide another hot-plate to, in all probability, meet with the same fate. Hot-plates, Mr. Bostal holds, should be so constructed that there is no necessity to stand over the pots and swab-up every drop of water that runs over, or keep the surface of the hot-plate free from condensed steam. He does not say how the construction is to be effected; but that is his opinion. The "Electrical Times" agrees with him. The apparatus, it says, must be made proof against such things, because it is "hopeless to train users to treat electrically heated utensils in a manner totally different from that which they adopt with vessels heated over a gas-ring or coal-fire." And so say all of us.

The All-Electric House. What are described as all-electric houses have been erected near Glasgow by Mr. George Hamilton, a local builder. The houses appear to be of the bungalow type, containing only four, five, or six rooms, so that they would be something about the size of residence that the average British artizan would need for himself, wife, and small family. The style of the dwellings will be gathered from the facts that they are rough-cast, with red asbestos tiled roofs. All lighting, heating, cooking, and hot-water supply is carried out electrically—the equipment consisting of an electric water-storage tank, a cooker, and electric-fires in the living and bedrooms. Nothing is said as to how many lamps and radiators are in use, or how much work is done by the water-storage tank and the cooker. The price that is charged for the whole of the current used for lighting, heating, cooking, and hot water supply averages 0·77d. per unit. Let us repeat this because it is interesting. The price that is charged for the whole of the current used averages 0·77d. per unit—an average price for domestic purposes that is without equal in the kingdom. What have the other electricity users of Glasgow to say about the people in these small houses getting lighting current at just about ¾d. per unit? Now at this low average price, Mr. W. W. Lackie, the City Electrical Engineer, estimates the average annual consumption for these four to six roomed houses at 10,000 units per annum each. 10,000 × 0·77d. = £32 1s. 8d. a year. But Mr. Hamilton lives with his family in one of the houses. He is a prosperous builder; he can afford to waste money upon fads. He puts Mr. Lackie's estimate to shame by using during twelve months' residence 16,000 units, which, at the low average cost of 0·77d. per unit, work out to £51 6s. 8d. a year; and this without any allowance for capital cost, repairs, maintenance, and renewals. The commercial and bank clerks living in Suburbia, with an income only two, three, or four times the amount Mr. Hamilton spends on current at 0·77d. per unit, will ponder long over this experience, and Mr. Lackie's estimate, before following the example. The lighting, heating, and cooking bill at 0·77d. per unit seems altogether out of proportion to the size and character of these red asbestos tiled bungalows. Our information is obtained from the "Electrical Times;" but speaking of these same "all-electric houses," the "Electrician" says: "It is a regrettable fact that only a very small percentage of station engineers and contractors show any enthusiasm in this regard; and they are therefore unable to point the way in their particular districts, and thereby give real encouragement to their consumers." We wonder if the writer of these words has an all electric-house. It is easy not to practise what one preaches.

The Local Audit and the Gas Company. A paper bearing the title of the "Democrat and People's Journal" is entitled to some respect. Such a paper is published in Dundalk; and most respectfully in one matter we dissent from its views. The Dundalk District Council run an electricity supply business; the Dundalk Gas Company carry on a gas-supply business, and are, as things go in Dundalk, large ratepayers. When the Local Government Board audit of the district accounts was in progress recently, the Gas Company thought well to be represented by their Manager and Secretary (Mr. G. Airth) and their Auditor (Mr. Smyth). The previous day these gentlemen demanded an inspection of the books of the Council, including those of the electric power station. This demand appears to have been refused. Before the Local Government Board Auditor objection was raised to the representatives of the Gas Company having access to the books of the Electricity Department, on the ground that they are business rivals. The result of the protest was that they were asked by the Official Auditor to submit their objections in writing. The "Democrat and People's Journal says: "It appears to us that it would be totally against sound public policy that the representatives of the Company should be permitted to pry into the internal affairs of the electricity undertaking—the Department and the Gas Company being rivals in business." Now let us point out to our local contemporary that the local rating authority (no doubt members of the Urban Council have something to do with this body) have a perfect right in making their assessments of the Company's property to look into their accounts. Point No. 1. Equally the Gas Company being one of the largest contributors to the local exchequer have a right to see that the Council are conducting their affairs properly. If the District Council ran a newspaper, and accepted advertisements at a cut-rate that did the "Democrat and People's Journal" trade injury, what would be the song then of this organ of "light and leading" in Dundalk? Point No. 2. Surely the Council have nothing to hide if they are conducting their electricity business on sound business principles. What are they afraid of? Point No. 3. There is no analogy such as our local contemporary attempts to draw between the position calling for comment and rival local tradesmen prying into one another's business. The private tradesmen are not working with public money; and they cannot fall back on the rates if they so conduct their business that deficits are made, and depreciation and other things are not properly provided for in their accounts. The electricity concern is a public business carried on by public money; and there is the power to fall back on the rates for support. Surely one of the largest ratepayers—a ratepayer, though business rival, who would have to share in any loss on the rival undertaking—has a right to see that the business is conducted upon rational and safe lines. To argue the contrary, may suit the "Democrat and People's Journal," but not commonsense business men.

Chemical Society and Organization of Science.—It has already been stated that, in pursuance of the desire of the fellows to assist the Government, the Council of the Chemical Society had constituted themselves a consultative body, to meet at frequent intervals, to consider, organize, and utilize all suggestions and inventions which might be communicated to them, and report on them to the proper authorities. In response to a circular issued to the fellows asking them to forward such suggestions or inventions, a number of replies have already been received; and in dealing with these, the Council are to have the assistance of special committees, each of which have been formed by a kindred society. Among the bodies taking part in the work are the Society of Chemical Industry, the Institute of Chemistry, the Institution of Mining and Metallurgy, and the Physical Society. Each of the societies will nominate six experts, who, with two members of the Council of the Chemical Society, will form a Committee to consider matters referred to them by the Council. In addition, a general Committee is being formed which will consist of twenty members; two being nominated by each of the co-operating societies. This Committee will consider general policy, not merely on questions directly relating to the war, but on all matters in which the opinion of a thoroughly representative body of chemical scientists is desirable.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Forthcoming Annual Meeting.

The programme was issued last week by the Secretary and Treasurer (Mr. Peter B. Watson, of Wishaw) for the fifty-fourth annual meeting of the North British Association of Gas Managers, which will be held at the Freemasons' Hall (No. 96, George Street), Edinburgh, on Friday, the 3rd prox. The chair will be taken at 10.30 a.m. by the President (Mr. J. B. Scott, of Cowdenbeath). This year there will be no excursion; but the Chairman and Directors of the Cowdenbeath Gas Company have issued invitations to a dinner for the members and lady friends at the North British Station Hotel on the evening of the meeting day. The Council have decided that there will be no lecture this year under the "William Young Memorial Trust."

In addition to the President's Address, the proceedings will include the reading and discussion of the following four papers:

"The Training and Education of Gas-Fitters," by Mr. R. W. Cowie, of Dalkeith.

"A Simple Pressure-Raising Device," by Mr. James J. Scott, of Lower Largo.

"Gas Measurement: Past, Present, and Future," by Mr. William Gordon, of Edinburgh.

"Sales of Sulphate of Ammonia at Home and Abroad," by Mr. F. C. O. Speyer, of London.

Subsequently, there will be a presentation of an illuminated address to Mr. George R. Hislop, of Paisley, in commemoration of his fifty years' service in the gas profession.

Report of the Council.

The report of the Council, which will be submitted for confirmation, points out that the membership on June 30 was 253—viz.: Ordinary members, 160; associate members, 14; extraordinary members, 72; honorary members, 7. Intimation is given of the death of two ordinary members—Mr. William Blair, of Helensburgh, and Mr. Thomas Lighbody, of Renfrew. Five members tendered their resignation last year; and there is a similar number of new members recommended for election. The Council announce that during the past year two applications for assistance from the Benevolent Fund were received, and, after inquiry, a donation was granted in each case. There is an amount of £662 to the credit of the fund.

SIXTY YEARS AGO.

From the "Journal" dated Aug. 10, 1855.

Considering the limited area now left by science for metaphysical and psychological speculations, it has often struck us with surprise that no dreamer of the phantasmagorial school should ever have thought of explaining how it happens that some people are to be found in this world of that peculiar temperament which prompts them to neglect whatsoever they are called upon to perform, and to strive anxiously for an opportunity of intermeddling in affairs with which they have neither connection nor knowledge. The fact that such people exist is quite undeniable; but upon what particular organ or "bump" we are to lay the blame of this unhappy defect remains still a problem. The motions of these people are of a retrograde character, and analogous to those of the crab; so that if this crustaceous animal could be made to give up its reason for preferring to walk backwards, perhaps we might arrive at some definite conclusion with respect to the individuals in question. What they are required to do, they always leave undone; and where their interference is neither solicited nor desired, they rush in with the foresight and impetuosity of a blind horse. When this disease [for such one must regard it] seizes upon a single individual, the consequences are for the most part injurious to himself alone; but when many persons are attacked simultaneously, the result invariably proves disadvantageous to the public. Of this latter form, we have now an unhappy example before us, as evidenced by the conduct of Her Majesty's present advisers. Everyone knows that the chief—indeed, almost the sole—duty deputed by the British nation to the Palmerston Ministry was the vigorous and successful prosecution of the Russian war. All other matters were deemed insignificant and secondary—in fact, the nation may be said to have undertaken to manage its own internal affairs, and to put up with any amount of inconvenience without a murmur, provided its honour and interests were zealously promoted by the success of our arms abroad. . . . Alas, it would appear that, intent only upon advancing their influence at home, they have allowed matters to take their own course abroad.

At the Manchester meeting of the British Association (being held from Sept. 7 to 11), Professor William A. Bone, F.R.S., will take the place of Professor H. B. Baker, F.R.S., as President of the Chemical Section. Professor Baker is unavoidably prevented from attending the meeting.

OVERLOAD CAPACITY AND INDIVIDUAL AND GROUP DRIVING.

In "Electricity Supply Memoranda" for Aug. 3, criticism was made of some superficial comments in the "Gossip" columns of "Electrical Industries" on Mr. H. C. Widlake's articles in our pages on the subject of "Power Production: The '*£ s. d.*' of the Question." Before the criticism in the "Memoranda" was published, our contemporary permitted itself to have a turn at a succeeding instalment of our contributor's article. But again superficiality predominated; so perhaps it is an inseparable characteristic of "Gossip."

In the course of his articles, Mr. Widlake wrote: "The driving of isolated machines by separate motors means that each motor must be so rated as to be able to supply the maximum amount of power demanded by the particular machine to which it is coupled. This would mean that during the greater part of its time a small, and consequently a comparatively inefficient, motor would be operating at a poor efficiency under an uneconomical load factor." Upon this "Electrical Industries" says:

> If anything is clear from these rather muddled sentences, it is that Mr. Widlake is ignorant of the overload capacity of the electric-motor. Moreover, he says nothing about the fact that, when a works is driven by a gas-engine, that engine—which possesses no overload capacity worth mentioning—must be equal in capacity to the maximum demand of the factory, although the average demand may be, and would be, in the vast majority of cases, very much less.

It will be observed that here the old and vexed question of rating is pressed into service again—the most cherished shot in the electrical man's locker when he desires to confuse an opponent. In an article in the "Journal" for June 22 last [p. 695], treating of a laundry installation, Mr. Widlake dealt very fully with the overload capacity of the gas-engine as that capacity actually exists, and not as the chimera which the electrical fanatic would like to represent it to be. It would not be a bad idea if the author of "Gossip" would try his hand at the article referred to, and deal with that piece of real practical experience. An electric-motor admittedly possesses considerable capacity for negotiating an overload. But this characteristic has been greatly abused, and always will be, by fanatics who persistently run an improperly rated machine until its state is such as to enable it to be used for culinary purposes with a considerable degree of success, and who, ignoring the fact that a machine is being run to its destruction, talk and write at length on "overload capacity."

Any prime mover—whether a steam, gas, or electric motor—is rated by its makers on a perfectly well-defined basis; and any attempt to run it on a load in excess of that for which it is designed, can only lead to detrimental results. A plain business man who has (say) a 25 B.H.P. motor calls it by that designation, and by no other. But the electrical enthusiast who is fighting the gas-engine alludes to it as a 20 B.H.P. machine, with a 25 per cent. overload capacity; and in his frantic desire to get there first, places himself in line with Louis De Rougemont, Ananias, Munchausen, and other celebrities whose speciality was a playful disregard of the truth. One thing is certain, the price paid for a prime mover is based upon the maximum power which the prime mover is capable of exerting—no matter to what degree one may juggle with terms.

Criticism was also made by the same writer of what Mr. Widlake had to say on individual and group driving. His article was written around, comparatively speaking, small power plants; and, unless the circumstances are very special, individual driving in connection with such plants cannot be regarded in the light of a commercial proposition except where electrical energy can be obtained at an unusually low figure, as capital charges in connection with a number of small and inefficient motors would wipe out any saving which this method of driving might otherwise effect. As readers are aware, many large power plants obtain current for their motors at an absurdly low rate, in order to keep a high daylight load factor on the public supply stations which would otherwise be running light; and this preferential treatment has been, and always will be (unless regulated by Act of Parliament) the subject of endless discussion, litigation, and controversy.

The losses attendant upon the use of transmission gearing have always been dressed-up by the interested electrical man in the cloak of a bogie with which to frighten the power user who contemplates driving his machines from some central power motor, unless this motor happens to be an electric one, when the electrical enthusiast may actually expound some theory as to why such losses with the same shafting, pulleys, belts, &c., will be less with an electric motor than with a gas or steam engine. It has been proved again and again that, with a good modern gas or steam plant (let us be fair), transmitting through the medium of modern well-lined-up gearing, such losses can be reduced to a minimum, and power be *delivered* at a rate per B.H.P. considerably lower than that achieved by the use of individual motors working on a public supply. The subject of individual and group driving is one on which much has been said and written; and the advantages or disadvantages of these two methods, as compared with running from a central power motor working in conjunction with line shafts, cannot be threshed out in a general manner, but only after careful consideration of each particular case.

Ingenious is the description applied to Mr. Widlake's suggestion for dealing with cases where a factory driven by gas power is either wholly or partly illuminated by electricity. Our contributor's suggestion was: "Such cases may be advantageously handled by pointing out to the proprietor that a small dynamo driven from the line-shafting will generate all the power likely to be required at a cost of something under ½d. per unit, according to the rate charged for gas for power purposes." Our contemporary's illuminating comment was: "Oh, Mr. Widlake!" In other words, it was incapable of arguing the matter, and so left it at that. It would be interesting to see some figures in support of the implied absurdity of a dynamo driven from a line-shafting being capable of generating current at about ½d. per unit.

Reference was also made to Mr. Widlake's assumption of a 100 per cent. load factor. His figures gave this favourable basis to the electric-motor as well as to the gas-engine and plenty of material was provided in the article to enable the intelligent power user to adjust the arguments to his own particular load factor.

Finally, the whole matter is one which can be reduced to the commercial basis of pounds, shillings, and pence; and this is precisely what the "gossiper" of "Electrical Industries" does not seem anxious to base his criticisms upon. All he does is, as we said in "Electricity Supply Memoranda" on Aug. 3, to content himself with pecking about in a superficial manner like a hen in search of grubs.

COKING AND BYE-PRODUCTS.

By "Event and Comment."

The Recovery of Naphthalene.

On very few bye-product coke-oven plants in this country is any attention paid to the recovery of naphthalene. Indeed, this substance is more frequently regarded as a bugbear, as, if not properly dealt with, it is liable to cause great trouble on the plant. Gas engineers are only too well aware of this latter fact, and usually they take precautions to prevent its deposition in the mains. In the hot direct recovery processes, unless great care is taken, naphthalene troubles are liable to occur; but in the semi-direct and indirect processes, they are not so frequent. In cases where a benzol recovery plant is installed, almost the whole of the naphthalene in the gas is absorbed by the creosote scrubbing oil, and it is quite possible, with very little trouble, to recover a good deal of this; and it must be borne in mind that crude naphthalene will find a ready sale at almost any time. The recovery of naphthalene from the scrubbing oil has also a further advantage, in that its removal from the oil allows the latter to remain in circulation for a much longer period. It is well known that creosote oil gradually increases in viscosity during the time it is circulating through the benzol scrubbers. This viscosity is very largely due to naphthalene, and ultimately it becomes so great that the oil is too thick to deal with, and the pipes conveying it round the plant tend to become choked. It is then necessary to stop the plant and steam-out the pipes. To recover the naphthalene, the hot oil issuing from the still after the benzol has been removed is run into large shallow pans. It should be allowed to remain there for at least 24—and preferably for 48—hours, with occasional agitation. The naphthalene crystallizes out, and settles to the bottom. It should be fished out with a perforated scoop and allowed to drain. It is then best pressed on the draining board, and packed into bags. In many benzol plants nowadays a fraction which boils at a temperature of 130° to 160° C. is separated. This can also be treated in a manner similar to the above, and the naphthalene recovered from it. It is essential to allow a considerable time for settling, as the separation of the naphthalene only takes place very slowly.

With the development of the manufacture of synthetic dyes in this country, it is more than likely that there will be a considerable demand for pure naphthalene, for this is the basis of artificial indigo and other dyestuffs. Again, too, the use of naphthalene for internal combustion engines is being developed, and promises to be highly successful; so that there are great possibilities for this product. Pure naphthalene is prepared from the crude product in the following way. The crude product is freed as far as possible from adhering oil, and is melted with about 5 per cent. of concentrated sulphuric acid. The excess of acid is drawn off, and the naphthalene distilled. It is also sometimes sublimed from a shallow iron pan, being heated by a steam coil. The product so obtained is collected and recrystallized from petroleum spirit, and the pure product obtained. Unless the subliming process is carefully carried out and close attention paid to the cooling of the vapours, an excessive quantity of the naphthalene is lost. Naphthalene is also recovered from the middle oil fraction obtained in the distillation of tar. This is the fraction which is used for benzol absorbing purposes, and it is treated in exactly the same way as described above in connection with the benzol plant.

Toluol Recovery and Beehive Ovens.

In these notes a fortnight ago, and also on other occasions, the writer has referred to the continuation of beehive coking—much to the detriment of the country, owing to the loss of much raw material for high explosives. Surprise at the inaction of the Government was expressed. It is now gathered that a move has been made, and that the Government officials are trying to impress upon people the wasteful character of beehive coking. It is unfortunate they have not gone a step further, and given some indication as to how to obtain the largest possible yields of benzol, toluol, &c. As already pointed out, gas engineers have been invited to assist the Ministry of Munitions in the matter of organizing supplies of toluol. However estimable these gentlemen may be, and often are, in their own profession, they are—in the majority of cases—distinctly out of place in this instance, for they are mostly totally unacquainted with the practical side of benzol recovery and rectification. In this respect, a writer in the "Yorkshire Post" a few days ago made the following remarks:

> Advisory committees have been appointed to assist the Government with regard to increasing the quantity of toluene, but not much has been heard up to now. Why on earth the Government appoint gas engineers, who, prior to the war, had no experience in the running of a benzol recovery plant, while men of highest scientific attainments in this branch are pushed aside, is difficult to understand.

In Germany, the coke-oven experts were quickly utilized in their proper spheres; and it is surely time this was done here too.

A WATER UNDERTAKINGS RETURN.

Ordered to be printed by the House of Commons in July of last year, there has just made its appearance—in the form of an unusually bulky Blue-Book—a "Return as to Water Undertakings in England and Wales." The return is divided into two parts; and that the information given extends to some 600 pages need cause no surprise, when note is taken of the ground covered.

The first part gives particulars of every water undertaking in England and Wales, while the second shows how each district and parish is supplied with water. The provision of works necessary to supply, from any natural source, water for domestic purposes to not less than ten houses or to standpipes has, for the purposes of the return, been considered an undertaking, whether or not the supply be given under specific statutory powers, and whether furnished gratuitously or for profit. Supplies which are regulated by Special Acts, but in connection with which the water distributed is obtained from other undertakings, have also been included. For the most part, the information given has been corrected to Jan. 1, 1914; and the return, it is stated, may be regarded as the first instalment of the detailed and comprehensive investigation of the whole subject of surface and underground water supplies which has been recommended by various Royal Commissions and Committees. Any point that may be raised as to the appropriateness of publishing such a huge statistical volume just at the present moment—when everybody is busy telling everybody else how they [the other persons] can economize—will no doubt be met, and quite fairly so, by the remark that the work was started, and most of it was done, long before the war was even thought of—the original inquiry forms having been sent out three or four years ago. The information received was then revised, so as to bring it up to the end of 1913.

By reference to Part I., the investigator is able to ascertain, with the smallest possible amount of effort, the powers (if any) under which the undertakers are authorized to supply water; the limits within which they are authorized to do so; the places actually supplied; the sources of supply, their nature and sufficiency; and particulars as to the works, and the quantity and quality of the water supplied. Part II. shows the area and population of every district in England and Wales, and the number of houses therein; the number of houses supplied with water from a piped service; the names of undertakers providing a supply of water; and the source, nature, and sufficiency of the supply where there is no piped service. From this it will be gathered that the return, unlike those issued annually which relate to gas undertakings, does not deal in any way with the financial aspect of water supply. The particulars that are given refer to the undertakings of 786 separate local authorities, the Metropolitan Water Board and 34 other joint authorities, 200 companies with statutory powers, 84 private companies, and 1055 private proprietors. The undertakings owned by local authorities include, of course, some of the largest in the country. First come London, Manchester, Liverpool, and Birmingham; then come four other places each of which supplies more than 12 million gallons per day. These are followed by eleven other local authorities supplying between 5 and 12 million gallons; while there are in all 130 of these bodies who furnish more than half-a-million gallons a day. It may be added that the daily figures for the four first named for 1913-14 are given as: Metropolitan Water Board, over 244 million gallons; Manchester, 44 millions; Liverpool, 34½ millions; Birmingham, about 21¾ millions. Apart from the Metropolitan Water Board, the largest joint undertakings are the Tees Valley Water Board, who distribute 15 million gallons daily, and the Derwent Valley Water Board supplying in bulk just over 10 million gallons a day to their constituent authorities, for distribution by them. The South Staffordshire Water-Works Company, supplying nearly 16¾ million gallons a day, have the fifth largest water undertaking in England and Wales, the two next largest companies being those at Bristol and Newcastle-on-Tyne. Altogether there are 66 companies each supplying over half-a-million gallons daily.

The return is prefaced by a preliminary memorandum extending to over forty pages, which itself contains a great deal of useful information. In the first place, there is a history of the water supply of the Metropolis, from the year 1543—when the Hampstead Water Act, the first Private Act of Parliament relating to London water, was passed—down to the present time. Then there is a chapter on water supplies outside the Metropolis, in which some particulars are given as to early municipal undertakings. It would seem that Southampton was first in the field, with the establishment of a municipal supply in 1420, followed by Hull in 1447, and Bath in 1500. The earliest Local Act authorizing a municipal water supply appears to be one of 1541, conferring powers on the Mayor and Dean of Gloucester. Next came the well-known Act of 1585, obtained by Sir Francis Drake, for Plymouth. A brief account is given of legislation of a public character dealing with the question of water supply, and reference is also made to the different inquiries into the matter which have been held by Royal Commissions. The provisions of the Public Health Act of 1875 enable a water company to sell or transfer their undertaking to a local authority by agreement; but apart from this facility, which has not been extensively taken advantage of, about a hundred Special Acts have been passed since 1876 giving power to local authorities in England and Wales to purchase the undertakings of water companies supplying their districts.

As to sources of supply, it is remarked that for some years the supply of underground waters—wells and boreholes—has been on the increase, and the proportion of underground to surface waters used has been constantly growing. As a matter of fact, the statistics show that at the present time 340 local authorities, 13 joint authorities, and 142 companies derive supplies from wells and boreholes. The total amount of underground water supplied by piped services for domestic purposes—not including water derived from surface springs or stand-pipes—is roughly estimated at 285 million gallons a day. It is shown that 200 local authorities, 14 joint authorities, 89 companies, and 116 private proprietors filter their water. In the great majority of cases, the supply of water by undertakings is constant. It appears from the return that water is now supplied by a piped service practically to every densely populated place in England and Wales; and most of these supplies are wholesome and quite adequate. The greater part of the population which has a piped service of water, too, is now supplied municipally.

It is pointed out that the powers of the general law have not sufficed to give local authorities or companies all the powers necessary for their undertakings; the chief defect being that no machinery is provided for taking water rights compulsorily. This being so, a note is made of fresh legislation which has been suggested on the subject of water supply; the proposals being as follows: That Rivers Boards should be established to control the watersheds of the various rivers of England and Wales, the prevention of pollution of their waters, and the management and distribution of the water supplies derived from them, and of the underground supplies of their areas; that the Local Government Board should be empowered to make Provisional Orders for the compulsory acquisition of water rights; that in schemes for supplying towns from any particular river basins provision should be made for supplies to be furnished to the neighbouring villages; that section 52 of the Public Health Act, 1875, should be amended so as to further safeguard the rights of local authorities with regard to parts of their districts placed within the limits of statutory companies and not supplied by them; that local authorities should be empowered to make bye-laws regulating the construction of shallow wells; that local authorities should be empowered to make bye-laws as to the provision of proper water-fittings; that it should be made the duty of the local authority to obtain orders to close all polluted wells; that local authorities should be empowered to provide, or to cause to be provided, a supply of water for a group of houses, and to apportion the expenses as they deem just among the owners having houses within a reasonable distance of the source of supply, with an appeal to the county council or to a court of summary jurisdiction, in place of the provisions in the Public Health (Water) Act, 1878; that owners should be compelled to lay on water where a pure and wholesome piped supply is provided; that further power should be given to prevent the occupation of a new house until a proper water supply is provided; and that county councils should be empowered to combine contributory places in different sanitary areas for the joint provision of a supply of water.

Palace of Industry for London.—It is intended, in the early part of 1917, to open as a permanent institution a Palace of Industry in London, with the idea of holding two fairs, in spring and autumn respectively, in which will be exhibited the main industries of the Empire. The palace will be managed by an Advisory Council consisting of representatives of all the trade associations of the United Kingdom. The site chosen is at Willesden Green, where 44 acres of land have been secured. Only wholesale manufacturers and their agents will be allowed to show their products; and admission will be limited to traders and other possible customers. In short, the fairs will be run on the same lines, and for the same object—the pushing of trade—as the Leipzig Fair.

THE ROAD MAKER AND ROAD BREAKER.

A PLEA FOR CONSIDERATION BY ONE FOR THE OTHER.

By Reginald Brown, M.Inst.C.E., M.I.Mech.E., &c.

In a paper read by me before the 1915 annual meeting of the Institution of Municipal and County Engineers,* I put forward certain of the difficulties arising from the continual breaking-up of the highways by statutory companies, and made certain suggestions as to the remedies which might be adopted for the mutual advantage of both local authorities (as road makers) and statutory companies (as road breakers). This article will, therefore, I hope, appeal to "Journal" readers because of the utmost importance of the subject to gas and water authorities. It is in reality a plea for the consideration of one body for and by the other; and I am convinced that if any reasonable suggestion or suggestions can be put forward both of the bodies concerned will be only too pleased to adopt same if it can be shown that (1) it is to their mutual advantage, and (2) that it entails no more cost than under existing conditions.

Briefly speaking, statutory companies have the right to open a road maintainable by the inhabitants at large after giving three days' notice—or without notice in case of emergency—of their intention to do so to the road authority, and subject to the supervision of that authority. In addition, they are bound to replace the trenches as quickly as possible, and to maintain them for three months after making good, or so long as the trench continues to subside, but not exceeding twelve months. On the other hand, the road authority are to supervise the opening and filling-in. If they fail to do so, then the companies may proceed without such superintendence.

The road authority, being the parties responsible for the proper maintenance of the roads, must also inspect the trench from time to time to see that it is properly kept up; and if it is not, then they have the power to do the necessary work and charge the persons in default with the cost thereof. All this is common knowledge; and on the face of it there seems no reason why any difficulties should occur—if both companies and road authorities do their duty, and act in conjunction with each other.

"Road Breakers" as Ratepayers.

Now what are the views of both sides? Take those of the "Road Breakers" first. They say, in effect: We are a body of persons having statutory powers to supply the general public with necessities. The public must have our goods, and the duty cast upon us can only be carried out by laying pipes in the highways. We have laid out and continue to lay out, large sums of money in erecting works for the supply of water and gas, all of which are subject to rates. What is more, every yard of pipe laid by us is also subject to rating. Hence we pay our share of the ordinary highway expenditure, whether it be for making new or maintaining existing highways, although we may have little advantage from same. In addition, we pay our share of rates to the other services of the local authority and get no value, direct or indirect, from doing so. Our profits, in many cases, are limited; and the public gain advantage of this restriction by reduced charges. The greater the expense we are put to, the higher the charges to our customers—the public. We want to carry out our statutory duties; but we do not want to be subjected—nor do we think it fair we should be subjected—to irksome regulations and charges as to maintenance of the trenches we are compelled to open.

The Duty of Road Makers.

The "Road Makers" say, in effect: We are a body of persons elected by the ratepayers of a district of which the road breakers are part, and charged with the statutory duty of maintaining the public highways. It is our duty to see that this maintenance is carried out at the most economical rate, and in the most efficient manner, consistent with the amount of money at our disposal. We agree that the road breakers are carrying out a statutory duty, and that the public must have the goods; and we also agree that they—the road breakers—are large ratepayers and pay the ordinary rates. But we join issue with them when they say that no value, direct or indirect, is enjoyed by them. We are quite aware of the limitation of profits; but we think that, in view of their monopoly, this limitation is quite a correct thing. We also say that the continual breaking-up of the road for pipe laying is the greatest culprit in the case of highway maintenance.

For the purpose of this article, it is only necessary to deal with the claim of the road breaker—that he should not be subjected to irksome regulations and charges for maintenance, and also with the claim of the road makers in connection with these same regulations and charges. To do this it is necessary to analyze the present methods, and see if there is anything which requires modification.

A company desire to lay a pipe, give notice to the road authority, open the ground, lay the pipe, fill in the ground, remove the surplus, and finally either maintain themselves or pay the road authority for doing so. The only things that matter to the local authority in connection with this procedure are the necessity of opening the road, the receipt of the notice, and the reinstatement and maintenence of the surface disturbed. But the efficiency and the cost of both reinstatement and maintenance depend upon the filling in.

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* See "Journal," July 6, p. 26.

Closer Relations between Breakers and Makers.

First as to the necessity of opening the road. Road authorities feel sore on this point. A road, maybe, has just been put in repair, and directly afterwards a statutory company comes along and tears it up again for the purpose of either laying a new main, a house connection, cutting off or re-connecting a house supply, or repairing some defect. Now most of these could be obviated with a little foresight. New supply mains are not laid every day; and it ought to be a simple matter for gas and water engineers to be in touch with the municipal engineer, so that mains may be laid before any road repairs are put in hand. But companies are not the only culprits—the local authorities themselves sometimes break-up the roads directly they are made for the purpose of laying new mains, because the road repairs cannot wait until the necessary formalities have been gone through before the requisite financial arrangements have been carried out.

In this connection, I suggest that the companies should not take the advantage of only giving the statutory notice, but should give the road authority as long a notice as possible. Gas and water engineers know when it is probable that new mains will require to be laid, and they should notify the municipal engineer of this. On the other hand, the municipal engineer should notify the companies of any intention to extensively repair or pave a road, so that the latter may attend to any known defects in their mains or expedite the laying of new mains should any be required at a comparatively early date. This procedure is followed in a good many towns with mutual advantage to both companies and road authorities. [Point No. 1.]

Service Laying.

Laying new mains is, however, not the greatest culprit. It is principally the small trenches crossing the road from crown to kerb that cause so much trouble. Gas companies are the biggest culprits in this matter, especially since the introduction of the prepayment by meter system. Water companies are not so much at fault, inasmuch as the house services are generally laid in a road before it is "taken over" by the road authority; but they are culprits to a lesser degree for services to houses in existing roads. In this case, it is surely possible for the companies to save a little inconvenience by "drawing-in" services below tar paved and such like paths, as no amount of repair to the surface can reinstate the paths in such unbroken surface as originally existed. [Point No. 2.] With flagged paths, there is not so much objection to opening. I will deal with the carriageway portion later on.

Cutting-off and Reconnecting Supplies.

Another fault is the opening of a road for cutting-off a supply to a house—either for non-payment of rates or because the property is empty—and again opening the road for the purpose of reinstating the supply. The water companies (except probably the Metropolitan Water Board) are the greatest culprits in this respect. Gas companies, on non-payment of the gas charges, can remove the meter and summons the person in default for money due, or, in the case of empty property, can also remove the meter if necessary, and there is no trouble in reinstating the supply. With the water company, however, the usual procedure is to cut off the water on non-payment of rates or for empty property. This necessitates opening the road on two occasions—first for cutting-off, and then for reinstatement. In the Metropolis, the water is not allowed to be cut off for non-payment of rates. The procedure is to summons the person in default for money due; and what is suitable and satisfactory in the Metropolis can surely be applied by companies working in provincial districts. [Point No. 3.]

As to empty properties, there is somewhat of a difficulty with water companies, as in the majority of instances there are no means of cutting off the supply except at the main. But I suggest that, even in this case, the cutting off might take place at the stopcock just inside the premises. [Point No. 4.]

In repairing some defect in a service or a main, it may, of course, be necessary to open-up the highway. But here, again, the defect may be caused by the use of heavy traffic on roads with weak foundations, or the services being laid too shallow; so that all the fault of openings for repairs must not be placed on the shoulders of the company. [Point No. 5.]

In dealing with the present procedure, we first have the notice to the road authority. This is necessary so that the direction of the line of pipes may be agreed upon, and also to give an opportunity for supervision by the road authority. But there is no hardship on the companies in this respect.

The Art of Opening and Filling-In.

I come now to, probably, the most important difficulty of all, and that is the "opening and filling-in" after laying a main or service. Gas and water companies as a rule do not employ men skilled in road making, but "mainlayers;" and a man who is suitable for the latter may be entirely unsuitable as a road maker. He does not see the importance of keeping the material removed from the trench in such a way that it can be replaced in an exactly similar order on its return, neither does he see the importance of thoroughly ramming the soil, so as to leave as surplus little more than the area occupied by the main itself.

Supervision.

The companies will probably say the duty of supervision rests with the road authority, and if the work is not done properly the fault lies with that authority. Now do let us look at the matter from a common-sense point of view! When one person employs another to do certain work, he first takes care that the employee is one who is capable of doing it in its entirety; and after giving him general instructions of what is required, the employee is expected to carry out the work in a satisfactory manner without having someone continually in attendance to superintend. Gas and water companies when laying mains—it may be in several parts of a district at one time—do not always engage foremen to superintend each (and every part of each) main being laid, because this is not only unnecessary—it would be wasteful. In many cases, one foreman only is employed to give general superintendence to all the minor mainlaying jobs. Surely if this is thought sufficient by the companies, they ought not to expect more from the road authorites. The general superintendence by the company is for the purpose of the company and for which they get a monetary return; the general superintendence by the road authority is for the purpose of the general public, and for which they get no monetary return.

In addition to this, the fact that the trenches are in all parts of a district, and there is no definite time when such trenches are to be opened or filled-in, it is next to the impossible for adequate superintendence to be given; hence the capabilities and good faith of the companies' men have to be relied on to a very considerable extent—in fact, one might say wholly. Therefore statutory companies should employ men who are not only skilled in mainlaying, but also in road repairs. [Point No. 6.]

I feel sure that companies will at least concede the necessity of replacing the material in trenches in the order in which it is removed, and also of the proper consolidation of the trenches during refilling operations. But how is this to be secured? I say by proper superintendence and the elimination of the human equation as far as possible. I claim that superintendence, in the ordinary accepted term, can be dispensed with if the men are trustworthy—*i.e.*, if Point No. 6 is conceded by the companies and accepted by the road authorities.

Mechanical Aid in Ramming.

The proper filling-in and reinstatement of trenches is just as important for one as it is for the other. To the company it means less expense for maintenance (if they maintain direct); to the authority, it means a better surface to the highway and also less expense (if they maintain the trenches at an agreed schedule of prices). It is generally acknowledged that to refill a trench properly there should be two rammers to one filler; so that the material may be punned in thin layers. But in many instances the proportion of men is reversed, with a consequent greater liability to sinkage. Again, even with rammers (men and tools) there are rammers and rammers—no two men will ram alike, no two men will give the same consolidation even with the same weight rammer.

I therefore claim that the only consistent method is to ram by mechanical means. This would be a simple operation, and would only entail a small portable oil-engine and compressor, or even a compressor driven from a steam-roller, with flexible tubing supplying compressed air as the motive power to one, two, or more portable rammers. The rammers need only be comparatively light and small tools, somewhat similar to a riveter, and could have interchangeable ramming feet for ramming round the sides of the pipe or in the main body of the trench. By this means the trench would be rammed quickly and in thin layers, and, in addition, the consolidation would be almost perfect. [Point No. 7.]

Putting aside the cost of the machine for one moment, such an arrangement would, I am sure, more than repay itself by more efficient consolidation and lower "after maintenance," even if the companies had to bear the cost of such a machine. It ought to satisfy a road authority if a company made arrangements for them to open the trench and reinstate at the cost of the company without any further charge for maintenance. What do the companies and local authorities say to this suggestion? The companies will probably say that such an arrangement could not very well be made, as they keep special gangs of men for this purpose. On the other hand, the road authority might say that they could not keep a gang of men ready to go at any time when ordered by the company, because such a gang would not always be employed.

A Suggestion.

Both excuses are legitimate, and I suggest a half-way—a happy medium, between the two. It would not be a difficult matter for the road authority to have one or more men—according to the size of their district—who could attend at the spot where the trench is to be opened and assist the company's men in the work, and be responsible to the road authority for its proper reinstatement. Such an arrangement would not be more costly to the company than under the existing conditions, because they would employ direct—one man—less, and would only pay the road authority for the time the latter's man was engaged on the company's work. [Point No. 8.]

As to the filling in, the mechanical rammer could be provided by the road authority, and be worked by their own man—the company paying the authority the same as they now pay for reinstatement, or the actual cost, and be freed from liability as to maintenance. [Point No. 9.]

Points for Consideration.

Now let us summarize the points referred to:

(1) Gas and water engineers, on the one hand, to give as long a notice as possible to the municipal engineer before

laying new mains, and the municipal engineer to notify the gas and water engineers as long as possible before any large repairs or paving a street; so that the companies could expedite the laying of any new mains required in the immediate future—or, better still, periodical meetings between the various engineers with this end in view.

(2) Services under path to be laid in on the "drawing-in" system under tar-paved and such-like paths.

(3) Water companies not to open road to cut-off water for non-payment of water rate, and consequent re-opening for re-instatement of supply, but to summons the person in default to recover money due.

(4) Water companies not to open road to cut-off water supply to empty houses, but to do this inside the private premises, near the controlling stop-cock.

(5) Blame for opening road to repair defects in pipes not always to be placed on the shoulders of the company.

(6) Companies to employ not only trustworthy men skilled in pipe-laying, but who are also skilled in road repairs.

(7) The employment of mechanical means to replace manual labour for ramming material in trenches.

(8) The road authority to supply one man when called upon by the companies to assist their men in opening and filling-in and reinstating, and the company to pay the actual wages of the man for the time employed. This man to be responsible to the road authority.

(9) The road authority to provide for the use of the companies a mechanical rammer, or rammers, to be worked by the authority's own man, and company to pay charges for re-instatement and maintenance as now paid, or actual cost. Companies to be freed from liability for maintenance.

Let all gas and water companies and road authorities look at these points seratim, and, if needs be, let all or any of them indicate their defects and suggest something better in place thereof. Certain it is that all my suggestions mean mutual advantage to both sides; and I fail to see that any extra expense is put upon either. But "One man's word is no man's word. Justice demands that both be heard."

LIGHTING AGENTS AND FIRES.

In a volume of "Comparative Municipal Statistics (1912-13)," just issued by the London County Council, and referred to in a paragraph elsewhere, particulars are given as to the causes of fires by electricity, gas, and oil:

Fires Caused by Electricity, Gas, and Oil.

—	Electricity.	Gas.	Oil.	Number of Electricity Consumers.	Number of Gas Consumers.
London . . .	152	210	195	143,980	1,223,995
Birmingham .	18	60	20	7,435	165,784
Liverpool . . .	17	15	32	—	149,525
Manchester . .	25	30	—	12,568	185,295
Sheffield . . .	9	6	6	5,464	97,375
Leeds	5	7	1	10,108	112,884
Bristol . . .	5	32	23	4,227	61,021
Newcastle . .	8	7	1	—	117,925
Cardiff . . .	—	4 & 6	1	2,813	37,268
Swansea . . .	2	5	3	2,771	21,539
Glasgow . . .	17	14 & 20	4	27,848	286,883
Aberdeen . . .	3	4	4	2,947	42,539
Belfast . . .	1	9	1	3,453	78,824

In some cases data as to the number of fires were not available. From the general statistics relating to gas and electricity supply, we have extracted the number of consumers of gas and electricity; and when one examines the figures in relation to the number of fires caused by each agent, a tale is told that is highly favourable to gas, and shows that it cannot be truthfully charged by its worst enemy with being a less safe agent than its competitors.

GAS AT THE PANAMA-PACIFIC EXPOSITION.

The use of gas for cooking, heating, and lighting throughout the Panama-Pacific Exposition, when considered in connection with the most complete Collective Gas Exhibit in the Palace of Manufactures, brings gas into its own, says Mr. E. C. Jones, of San Francisco (the President of the American Gas Institute), in the Monthly Bulletin of the American Commercial Gas Association.

Describing this exhibit,* Mr. Jones says that in a beautiful pavilion at the north end of the Palace of Manufactures are gathered together the results of the latest developments in the uses of gas. The exhibits are artistically arranged and presided over by competent demonstrators; and visitors may follow the gas business from the crude materials from which gas is made, to the ultimate rendering of brilliant light rays which combine efficiency and economy in illumination. The lighting effects of the exhibit are provided by the Welsbach Company and the General Gas Light Company. The Welsbach Company have installed a bungalow in which are displayed the latest designs of semi-indirect lighting; and residence lighting is featured so as to emphasize the artistic beauty, brilliancy, and economy of incandescent gas lighting. The General Gas Light Company occupy a very prominent corner space, in which is displayed a complete line of the latest types of lamps they manufacture, and the mercury valve control for distance or ceiling lighting, also an excellent line of gas-irons. Both of these exhibits make a feature of the evolution of the gas-mantle throughout the different stages of the process of manufacture. The Collective Gas Exhibit has demonstrated the fact that the best advertisement of gas for illumination is light. The General Gas Light Company and the Welsbach Company came to the front with an offer to furnish all the necessary lighting fixtures, glassware, and mantles for the complete equipment of the exhibit and the maintenance of these lamps.

When it is considered that the exhibit is lighted by 14 five-mantle arcs, 61 three, four, and five mantle semi-indirect fixtures, 80 bracket lamps, 8 inside arc lamps, and 14 outdoor single-mantle lamps, which does not include the lamps on display by the Lindsay, Welsbach, and General Gas Light Companies, the generosity and "gas man's spirit" of this donation to the welfare of the industry may be appreciated. The generous spirit of the exhibitors has been reflected in the attitude of the Committee in their efforts to advance gas. The consumption of gas is about 20,000 cubic feet a day; and to encourage its use, the Committee decided to give free gas to exhibitors.

Everything modern and worth considering in the way of gas cooking and heating appliances is exhibited by the various manufacturers. These appliance exhibits occupy 2200 square feet of floor space, filled with the latest and most attractive gas-stoves. Demonstrators are in attendance; and there are special cooking lectures covering the entire field of the culinary art. To avoid the placing of gas-meters in each space, the gas is measured by two big meters, forming a most important exhibit in themselves. There are also the latest improvements in gas laboratory apparatus, including photometers, calorimeters, and the different standards used in photometry.

The cheapness of gas is nicely demonstrated by a stand of twenty gas-burners, each consuming 5 cubic feet of gas an hour, connected to a penny prepayment meter so arranged that, by dropping a cent into the meter, the twenty gas-lights are turned on, and invariably with the result that one is impressed by the large amount of light obtainable for the small amount of 1 cent.

The broad-mindedness of the exhibitors is shown by the exhibits of coal, coke, and the different bye-products, as well as retorts for making coal gas, models of benches, and coke-ovens. The classification covering gas exhibits is the first in the history of expositions that has permitted the entering for awards of the material from which gas is made and of the gas itself. This has greatly added to the interest of the Collective Gas Exhibit in many ways. The Consolidation Coal Company, of Baltimore, show a block of gas and coking coal, 30 inches square and over 5 feet in height, weighing about 1500 lbs. Different grades of coke are also on exhibit. Coke-ovens and their products are exhibited by the Semet-Solvay Company, of Syracuse. In the centre of the exhibit is a large plate-glass cube representing 31 cubic feet of available gas remaining from the coking of 10 lbs. of coal; and within this crystal cube there is another cube of coal weighing 10 lbs., and placed around this coal are 7·38 lbs. of coke and the exact quantities of the ammonium sulphate, tar, and benzol produced from 10 lbs. of coal. This is an ocular demonstration which amounts in the ordinary mind to a revelation of the valuable materials obtained from the distillation of coal. The H. Koppers Company, of Pittsburgh, have an attractive exhibit, including a model of their latest coke-oven with the plans and photographs of coal plants and installations of Koppers ovens with the recovery of bye-products. Interesting features of the exhibit are two glass cases, one containing exactly a ton of coal, and the other the amount of coke yielded by a ton of coal, which is approximately 1500 lbs. This exhibit also contains nicely displayed samples of bye-products obtainable from a ton of coal; and on a table is a small gas-lamp so adjusted that the gas from a ton of coal will operate it continuously for 2000 hours.

After describing other exhibits in detail, Mr. Jones concludes by remarking that one of the most important and best deserved victories for gas at the Exposition was the installation of nearly 300 high-pressure gas-lamps of approximately 1100-candle power each, placed on ornamental posts along some of the principal avenues of the Exposition and throughout the States and Nations Sections of the grounds. These high-pressure lamps have also been placed on the top of kiosks in the grounds, thus mixing gas and electric lighting throughout the grounds without detriment to gas.

The Zone, which is the playground of the Exposition, is lighted by gas arcs concealed in ornamental lanterns suspended in groups of two on special standards, and extending the entire length on both sides of the Zone. These lights were furnished by the General Gas Light Company; and they hold their own against the most brilliant electric installations. Everywhere throughout the exposition gas is used for cooking, water heating, and warming the air of rooms.

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* The remarks here reproduced supplement in some respects the account of the gas lighting of the Exposition, by Mr. C. B. Babcock, which appeared a fortnight ago, p. 287.—Ed. J.G.L.

A FLICKER PHOTOMETER ATTACHMENT FOR THE LUMMER-BRODHUN CONTRAST PHOTOMETER.[*]

By E. F. Kingsbury, of the Physical Laboratory, United Gas Improvement Company, Philadelphia.

Equality-of-brightness photometers and flicker photometers have heretofore been built entirely separately from one another. In the literature of the measurement of light, the design and use of the one has been a distinct problem from the design and use of the other, though the results the former gives are often used as a criterion for the practicability of the latter. Consequently, in constructing a flicker photometer, it has been built from the beginning just for the one purpose—notwithstanding the fact that about half of a flicker photometer is identical with an equality-of-brightness photometer in its essential requirements. It should be possible, by interchanging the two dissimilar parts on the part common to both, to make either one easily converted into the other type of photometer. The result should be a photometer that is simple, compact, and capable of measuring either lights of one colour or lights of widely different colours with the best precision of the equality-of-brightness method in the one case and of the flicker method in the other. At the same time it is felt such an instrument should embody the latest approved features that are coming to be recognized as desirable in a flicker photometer.

It is the purpose of this paper to describe such an instrument which the author has devised in the shape of a flicker attachment to replace the telescope of the ordinary Lummer-Brodhun contrast photometer when it is desired to measure different coloured lights. The high precision and the wide distribution of this type of equality-of-brightness photometer justify its selection for this purpose, although there are other good instruments to which this idea could be even more easily applied with a slight modification of details.

The various details concerning this attachment will be better appreciated if, before describing it in detail, we briefly review the essential requirements of a flicker photometer. Wilde says the desiderata for an ideal photometer are:

1. It must be sensitive and certain on lights of different colour.
2. Rays must fall upon the illuminated surface perpendicularly to reduce angle errors.
3. Illuminated surfaces should be directly over the pointer on the bar.
4. When balance is nearly obtained, it should be easy to perceive which way the head must be moved to improve the balance, without the necessity of rocking it to-and-fro.
5. If complete reversibility is required, both illuminated surfaces should be identical, and must be the same distance from the eye.
6. In a flicker photometer, in order to secure sensitiveness, the transition from one surface to the other must be sudden, and there must be no dark line crossing the field of view, such as an unilluminated edge of a card.

These requirements are subject to considerable modification and addition. They are given, however, as illustrating a certain viewpoint in the construction and use of flicker photometers, and to emphasize the need of proper photometric procedure.

The use of the substitution method of photometry is strongly recommended with the direct measurement of distances wherever necessary. This makes the second, third, and fifth requirements unnecessary.

The fourth requirement is misleading, because one cannot obtain a satisfactory balance with the flicker photometer by merely looking at it in one position. The proper method of obtaining a setting is rapidly to vary the light intensity back and forth over the no-flicker peak, at the same time gradually narrowing the range until the point of minimum or no-flicker is found. The essential requirements only will be outlined below. They will not be discussed in detail, as they have been covered elsewhere.

The sensitiveness or precision requirements of a flicker photometer depend fundamentally upon one thing—the focussing of the observer's maximum attention upon the elimination of intensity flicker. The attention is secured in a rather negative way by eliminating all external factors that can divert it.

(1) Undue tiring of the eyes should be guarded against. This is secured mainly by making the field surrounding the flickering field light instead of leaving it dark. The intensity of this illumination should be equal to, or less than, the intensity of the comparison field. If brighter, it attracts the attention. The intensity and colour of this field do not seem to influence the accuracy—at least, within wide limits. This field should be illuminated uniformly and should be free from mechanical defects.

(2) There should be no mechanical flicker in the comparison field itself. This is secured by keeping the optical system clean, and making its focus in space and not on a surface. The focus of the eye-piece lens, of course, should be on the plane of the opening through the external field just referred to.

(3) In securing a balance, the colour flicker (as distinguished from the intensity flicker) should be reduced to a minimum by a proper regulation of the speed of alternation of the colours.

The requirements that make for agreement with the equality-of-brightness method are in each method: (1) A restricted field; (2) a high illumination on this field.

Dr. H. E. Ives has found that on a field size of about 2°, and at an illumination of about 25-metre candles, the flicker method and the equality-of-brightness method agree in their results, provided the same conditions are complied with in each case. A restricted field and a high illumination are somewhat interchangeable. But the candle power of many standard lamps and other light sources places a limit on the illumination; so that the field is restricted to make it equivalent to a higher illumination.

The requirements having to do with procedure have been mentioned—namely, that the substitution method be used with the direct measurement of distances. Where this cannot be done, care must be taken to reverse the comparison head, and also the lamps under test, unless complete reversibility of each has been shown to yield identical results.

The method of securing a balance with the flicker photometer mentioned above should be emphasized here. The relative intensities of the two lights under test should be capable of being easily and quickly varied over a considerable range. One method of doing this is shown.

In making a setting the light should be varied back and forth over the region of minimum or no-flicker, and the limits gradually narrowed-down to a balance. It is impossible to obtain good precision or accuracy by leaving the setting at any one point and trying to decide whether it is the correct point. There is no criterion for the judgment unless the intensity is changed.

The last general requirement is one of convenience. The parts should be easily accessible for cleaning, repairing, and demonstration.

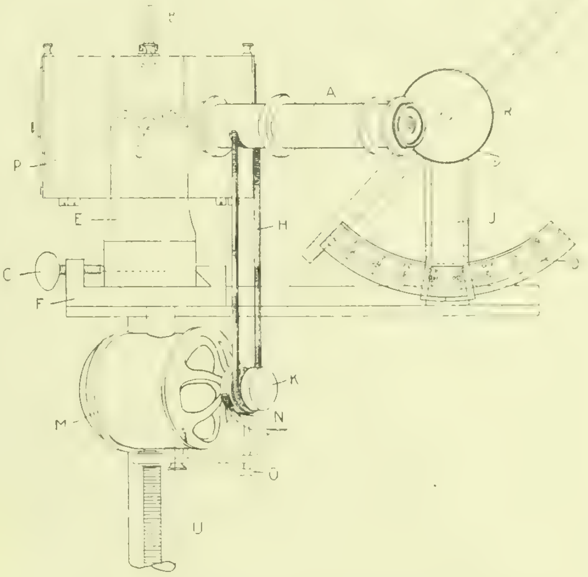

Fig. 1.—Elevation of Lummer-Brodhun with Flicker Attachment, Motor and Neutral Tint-Absorbing Screen, showing the Method of Clamping it to the Head.

A. Flicker attachment. B. Comparison disc. C. Axis of head. D. Scale. E. Casting supporting head. F. Clamp. G. Clamp screws. H. Belt. J. Index. K. Pulley. M. Motor. N. Friction brake. O. Brake screw. P. Lummer-Brodhun box. R. Screen knob U. Support.

The attachment with the motor and a neutral tint-absorbing screen is shown in position on a Lummer-Brodhun head in fig. 1. The attachment A screws into the head in place of the regular telescope. The only other change necessary in the Lummer-Brodhun is the removal of the contrast glasses, which the heads are built to permit readily. A belt H runs from the rotator within the tube to the motor M, which is attached to a clamp F that fastens to the horizontal casting beneath the box. The belt H is made of spirally-wound steel wire. It acts as a spring to take up any slack, and allows of the belt being easily slipped off the motor pulley. The part shown to the right is an addition, proposed by Dr. Ives, so as to facilitate reading, in the shape of a neutral tint-absorbing screen formed of parallel wires in the frame S. The frame is turned by the knob R and the transmission read on the scale D. This screen permits the light intensity to be easily and quickly varied over a considerable range, the desirability of which was mentioned above. In most cases it is more convenient to use such a screen than to move the light or the photometer head, though originally the attachment was intended to be employed as the Lummer-Brodhun contrast head would otherwise be. Dr. Hugo Kruss has a screen attached to his contrast photometer that would likewise undoubtedly work nicely with the flicker attachment, if the micrometer thread is not too fine. O on the motor is a friction brake designed to allow the speed to be changed quickly and easily over a wide range.

The attachment is shown internally in elevation in fig. 2. The right-hand end of the tube screws into the Lummer-Brodhun, and when the tube is in position, with the belt D downward to the motor, the collar C is screwed tightly against the box. This brings the attachment central and square on the head, and at the same time renders it rigid. A is a lens setting in a collar B that magnifies the Lummer-Brodhun field properly. E is a prism that sets in a cylindrical piece G; the whole being rotated in bearing H by the belt. The bearing is held in position by a screw beneath the tube. Upon loosening this screw the bearing with the rotating piece containing the prism can be slipped out of the tube either way if the belt is first unhooked and pulled out. K is the eye-piece, which consists of a brass tube covered at the far end with a disc J, in the centre of which is the hole making the 2° field mentioned above. The eye-lens is at P, set in a collar Q.

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[*] Communicated by the author to the "Journal of the Franklin Institute."

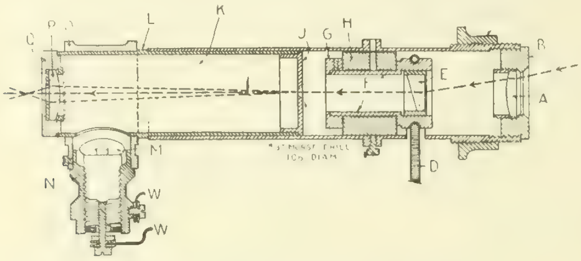


Fig. 2.—Elevation of Flicker Attachment.

A. Front lens. B. Collar for lens. C. Collar to hold telescope rigid in head. D. Belt. E. Rotating prism. F. Rotator bearing. H. Stationary bearing for rotator. J. Front of eye-piece. K. Eye-piece. L. Collar on eye-piece. N. Lamp socket. O. Rotating collar for lamp. P. Eye-lens. Q. Collar for lens. W. Wires to lamp.

The entire interior of this eye-piece K is painted white; and at M is placed a small 2-volt pocket torch-light, which, when lighted, sends its rays up in the eye-piece. This, in turn, being a matt-white, acts as an integrating sphere, and diffuses the light so well that in looking into the eye-piece through the lens one sees surrounding the 2° opening a uniformly illuminated surface. To allow the adjustment of the brightness of this surface to suit the observer, the socket N, into which the light sets, is fastened to a collar O, which turns on the eye-piece and moves the lamp over the solid part of the eye-piece—the whole arrangement acting as a shutter. It allows of the illumination being changed from too bright to absolute darkness, and at the same time always keeping it uniform. A spring in the collar pressing on the eye-piece insures the collar always turning smoothly. This collar can be slipped off the head of the eye-piece. The lamp socket can be slipped out of the collar on loosening a set-screw to allow the replacement of the lamp. L is a small collar fastened to the eye-piece that limits the distance which it can be slipped into the attachment tube, and at the same time the turning collar bears against it on the opposite side. When it is desired to remove the eye-piece, it is simply pulled out of the other tube, bringing J with it. The white surface is thus never exposed to careless handling. Fixed resistances (not shown) go in series with lamp and motor. Both are intended to operate on a 110-volt line to the head.

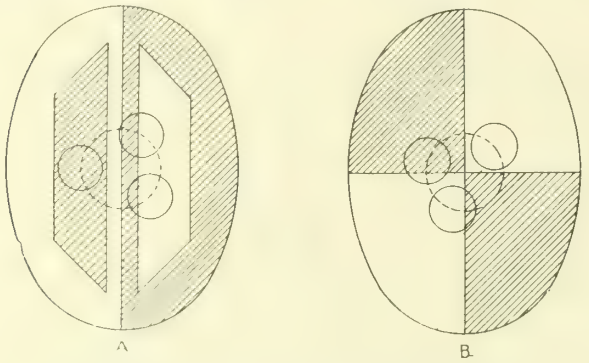


Fig. 3.—Diagrams to show how the Lummer-Brodhun Field (A) is cut by the Attachment; Also a Four-Part Field (B).

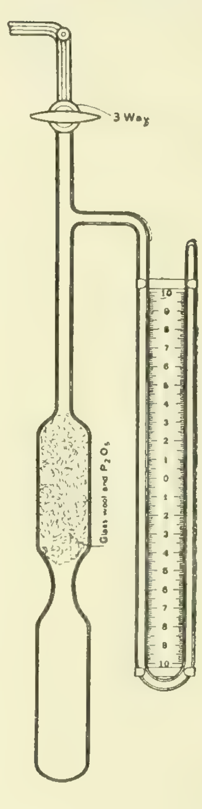
The method of cutting the Lummer-Brodhun field is indicated in fig. 3 (A). The dotted line shows how it goes from trapezoid to trapezoid; the circles representing three different positions of the rotating prism. B shows the four-part field used in the laboratory flicker photometer recently built in this laboratory. This four-part cube can be easily put in a Lummer-Brodhun box to replace the present one, if this type of field is preferred with the attachment. A question to be answered by the construction of this instrument was whether the regular type of alternation given by the Lummer-Brodhun field would result in less precision or accuracy than the four-part field. No difference was found on trial, the irregular alternation of fields apparently calling merely for a lower speed.

The real value of such an instrument as described is best shown in actually measuring large colour differences. A deep red monochromatic signal glass whose transmission was accurately known was measured against a 1·15 W.P.C. tungsten light on the other side; likewise a green signal glass and a 4 W.P.C. carbon lamp against the tungsten. In each case it has been found equal in precision and accuracy to the large laboratory instrument just referred to. The focus of the optical system of the attachment is in space and not on a surface; and, although the attachment was tested on a photometer head whose mirrors were badly corroded and needed replacing, no trouble was experienced from mechanical flicker.

It should be made plain that this attachment does not obviate the necessity of a proper selection of observers if the result is to represent that of an average eye. At least five observers should be used in this case, as has been carefully explained in a paper recently published concerning this point. This is required of all flicker photometers. In addition, care should be taken to remove the contrast glasses of the Lummer-Brodhun in using the attachment. If this is not done, there will always be an outstanding intensity flicker. This point has been mentioned previously, but is repeated here for emphasis.

DETERMINATION OF BENZOL IN GAS MIXTURES.

The Laboratory of Gas Investigations, Bureau of Mines, Pittsburgh, U.S.A., recently issued particulars of a scheme of analysis —by Messrs. G. A. Burrell and I. W. Robertson—carried out to determine the quantity of benzol in gas mixtures; and Dr. G. A. Hulett, the Consulting Chemist to the Bureau, has consented to the publication of the result in the "Journal of Industrial and Engineering Chemistry."



The investigators write: With the present great demand for benzol, and the installation of plants at different places for obtaining this constituent, there has arisen a demand for a rapid method of determining the benzol content of gas mixtures. Hence a scheme follows which the authors have used in determining it in the carburetted mixed coal and water gas of Pittsburgh.

An illustration is given of the apparatus. The bulb contains phosphorous pentoxide for removing water vapour. To start a determination, the apparatus is connected to a vacuum pump and exhausted of its air—a Gerky pump will do. The gas mixture is then introduced at atmospheric pressure; the barometer read; and the two bulbs immersed in a mixture* of solid carbon dioxide and acetone or alcohol. After waiting about ten minutes, as much gas as possible is withdrawn from the bulbs by means of the vacuum pump. The gases removed will be those of high vapour pressure at − 78° C. In the case of the mixed coal and water gas the authors worked with, they are CO_2, O_2, CO, H_2, CH_4, N_2, C_2H_4, C_2H_6, C_3H_6, C_3H_8, and C_4H_8; in fact, practically all the gases except the benzol. Next the stopcock on the apparatus is closed; the cooling mixture removed; and the benzol allowed to vaporize at room temperature. Its pressure is then read on the side-arm mercury manometer attached to the apparatus. This pressure compared with the atmospheric pressure gives the percentage of benzol in the gas mixture. The results of two determinations are shown in Table I.

TABLE I.—*Benzol Determination in Pittsburgh Gas.*

Sample No.	1	
Original pressure of gas . . .	744 mm.	744 mm.
Partial pressure of benzol vapour	10 mm.	9 mm.
Percentage of benzol	$\frac{10 \times 100}{744} = 1{\cdot}34$	$\frac{9 \times 100}{744} = 1{\cdot}31$

To obtain other data on this method of separation, the distillate from the above freezing process was next passed into fuming sulphuric acid. In the case of sample No. 1, there was obtained 7·32 per cent. of illuminants; and in the case of sample No. 2, 7·39 per cent. The total illuminants in the Pittsburgh gas, as found by absorption in fuming sulphuric acid, is 8·67 per cent. In other words, the benzol percentages, as found, when added to 7·32 and 7·39 respectively, will equal 8·66 and 8·70 per cent., or almost identically the same quantities as the total illuminants in the coal gas.

Benzene reacts with oxygen as follows:

$$C_6H_6 + 7{\cdot}5\ O_2 = 6CO_2 + 3\ H_2O.$$

The contraction is 2·5 volumes, and the carbon dioxide is 6 volumes.

Table II. shows the results of analysis of the residual vapour that was held in the liquefaction bulb shown, when the coal gas was cooled at a temperature of − 78° C. Before analysis the benzol was diluted with air.

It will be observed that the ratio of the carbon dioxide to the contraction is almost exactly 6 : 2·5—showing that the vapour obtained in the benzol determination was principally benzol.

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* This mixture gives a temperature of about − 78° C. The solid carbon dioxide, obtained by releasing the gas from a commercial cylinder, through a cloth towel, is mixed with acetone or alcohol to the consistency of slush.

Table II.—*Analysis of Benzol Vapours.*

	Cc.
Volume taken for analysis	28·29
Oxygen added	51·91
Total volume	80·23
Volume after burning	75·47
Contraction due to burning	4·76
Volume after KOH absorption	64·25
Carbon dioxide produced by burning	11·42

Traces of other easily condensable vapours may have been present, but apparently in such small quantities as to be negligible.

The authors were unable to find, in the literature, the vapour pressure of benzol at — 78° C., but apparently it is very small. Benzol boils at 80·12° C.; at — 20° the vapour pressure is 5·76 mm. The authors prepared saturated vapours of benzol by shaking the pure liquid with air. It was a simple matter to prepare unsaturated vapour by merely diluting the saturated vapour with air. The percentage of benzol was checked by combustion analysis. It was found that all of the benzol could be separated at — 78° C. The above tests show that, as far as the Pittsburgh gas is concerned, the method is satisfactory.

In extracting benzol from coke-oven gases [large-scale operations for this purpose are in progress], the gas is washed with a petroleum distillate, in which the benzol is dissolved, also toluol and other products. As a check on the efficiency of the scrubbing apparatus, there is needed a rapid test for the benzol, &c. In this case, toluol or other easily condensable hydrocarbons would interfere with the test, as the vapour pressure of toluol is only 0·0058 mm. at — 78° C. The best one could do would be to estimate them together, along with any other vapours that might also be retained, so that the test would give the efficiency of absorption of all the easily condensable vapours in the scrubbing oil. No experiments have been made with coke-oven gas.

COAL-TAR PRODUCTS USED IN MAKING EXPLOSIVES.

The current issue of the "Engineering Review" gives an abstract from one of the recent "Technical Papers" of the Department of the Interior, Bureau of Mines, United States of America, dealing with the subject named above. It is by Mr. C. G. Storm.

Mononitrobenzene, often known as "oil of mirbane," is little used in the explosives industry because of its volatility, although it is sometimes used as a minor constituent of certain low-freezing dynamites and other types of explosives. It is used much more extensively in soaps, lubricating greases, &c., mainly for the purpose of imparting a more or less agreeable odour. Furthermore, it forms an intermediate product in the preparation of aniline and its many derivatives.

Among the aniline derivatives of importance are tetranitroaniline and tetranitromethylaniline, both of which have in the past few years assumed prominence as detonating explosives for projectiles, mines, and torpedoes. Many other derivatives of aniline have been found to be applicable as stabilizers or as gelatinizing agents in nitrocellulose smokeless powders. Among such substances are methyl or ethyl phenyl urea, phenyl benzyl ether, phenylacetanilide, formanilide, and diphenylamine. The latter is, however, the only one which has been used in this country.

The nitrotoluenes are more extensively used in the explosives industry than any other nitro-substitution compounds—being employed chiefly for sensitizing certain types of ammonium-nitrate explosives and for lowering the freezing point of the low-freezing dynamites. In the absence of exact statistics, a rough estimate places the amount of the various grades of nitrotoluenes used in the low-freezing dynamites manufactured in this country in 1913 at about 2,000,000 lbs., while in the "permissible" explosives employed in coal mining probably 250,000 lbs. of the same materials were used during the same year.

Pure crystalline trinitrotoluene has proved one of the most efficient explosives for use in explosive shells, torpedoes, and mines, and is extensively used by almost every important military service, including that of this country. In recent years it has also come into use as a substitute for a large proportion of the mercury fulminate employed in detonators (blasting caps), and as a charge for detonating fuses.

The nitronaphthalenes are used to some extent, chiefly as sensitizers, in the "short-flame" permissible explosives of the ammonium-nitrate type. Certain derivatives of these compounds—the alkaline salts of nitronaphthalene sulphonic acids—produce, when mixed with sodium nitrate and other ingredients, explosives suitable for coal mining. Picric acid (trinitophenol) and certain of the picrates are highly important as military shell explosives; the acid is also employed in surgical dressings for burns and wounds. The manufacture of these compounds depends entirely on phenol (carbolic acid) as a raw material.

The possibilities of the use of the nitro derivatives of coal-tar products in explosives are far greater than is indicated by the above brief summary. Much investigation work on such compounds is being carried on in this country as well as abroad, from which important developments in the explosives art may result. The Bureau of Mines has instituted a systematic research into the preparations and properties of these nitro-substitution compounds with a view to studying their possibilities in the explosives industry.

LACLEDE GAS COMPANY'S NEW PLANT.

A Coking Oven and Bye-Products Installation.

Some weeks ago, there was put into operation by the Laclede (St. Louis) Gas Company a new gas and bye-products plant, which has been under construction for twelve months past, and has involved an outlay of $2,000,000. Under the President (Mr. C. L. Holman), the construction of the new plant was planned by Mr. George B. Evans (Chief Engineer) and Mr. T. H. Turner (Constructional Engineer). An illustrated description of the work done appeared in the "Gas Record."

The new plant is located at Carondolet, on a site of 180 acres, at the junction of the Rivers Mississippi and Des Peres. For the present, the railway facilities will be used exclusively, though everything has been arranged so as to easily utilize the abundant facilities for water carriage. The buildings are of concrete, steel, and brick, with the exception of the breaker building, the two screening plants, and the belt galleries, which are encased in galvanized corrugated steel. One of the principal features of the work is a plant for recovering benzol. This has cost $75,000; and it has been planned for an annual capacity of 300,000 gallons of benzol. The coal-handling plant is of a complete character, and includes a 1000-ton hopper to which the mixed and broken coal is elevated, and a 110 feet radius crane operating on a circular track, which will stack coal to a height of 40 feet, and take it out of store again as needed.

The Koppers Ovens.

The ovens proper consist of one battery of 56 combination regenerative Koppers ovens, having a capacity of 13¼ tons each, and designed for a coking time of 18 hours. Each oven is 37 feet long by 10 feet high, having a width of 18½ inches on the pusher side and 21 inches on the coke side. The construction of the regenerators, combustion nozzles, and oven-wall flues is such that an even heat may be maintained around the ovens, producing a good uniform grade of coke and gas. A reversing mechanism, actuated electrically and controlled by a time clock, changes the draft outlet and the gas and air inlets from one side of the battery to the other every half hour, thereby causing the products of combustion to heat the regenerators which were cooled during the previous half hour by the entering air used for combustion, so aiding very materially the fuel economy. A self-supporting brick-lined steel stack, 10 feet in diameter and 200 feet high, provides ample draught for the oven battery.

The combination feature of the ovens provides for the use of producer gas from separately-fired gas-producers. In anticipation of the use of producer gas for heating the ovens, each regenerator was divided by a fire-brick partition wall so that both the producer gas and air may be separately preheated before burning in the oven-flues above the combustion nozzles. In changing to the use of producer gas as fuel, it will be only necessary to remove a fire-clay plug from each of the two air-nozzles at the bottom of each oven-flue, and to connect-up every other air-inlet with the producer-gas main in such a manner that the flow of gas will be controlled by the reversing mechanism. The removal of the fire-clay plugs from the air-nozzles at the bottom of each oven-flue will so enlarge the holes that one may be used for admitting air and the other producer gas.

Gas from the ovens is conveyed by ascension-pipes to either of two parallel collecting-mains, just above the pusher-side of the ovens—one provided for the rich gas made during the first hours of coking, and the other for the poor gas made during the later hours. Electrically-operated governors maintain a constant pressure on the collecting-mains by opening or closing a butterfly valve, which allows the gas to escape to a lower pressure—maintained in the foul mains by exhausters in the bye-product building. In charging an oven, the collecting mains are dampered, the ascension-pipe capped, and the coaling doors on top of the oven opened. Electrically-operated door machine cars on either side remove the doors; a coke-guide car is placed in position on the coke side for guiding the coke into a quenching car, which is cast-iron lined, has a sloping bottom, and is provided with dumping doors operated with compressed air. A signal from the whistle of a steam locomotive coupled to the quenching car starts the ram of the pusher machine on the other side of the oven; and the coke is pushed out of the ovens through the coke-guide car and on to the quencher car, and the ram then withdrawn. The doors are again placed in position, luted, and the oven charged from above with a weighed amount of coal from the storage bin. In the meantime, the hot coke is removed to the quencher station, where it is heavily sprayed from an overhead tank for a specified number of seconds, and the water given time to drain off. The car is then brought alongside a cast-iron wharf, where the coke is deposited, and any local hot spots sprayed individually with a small hose.

Coke-Handling System.

After cooling and drying on the coke-wharf, the coke is allowed to slide through a sectional hand-operated gate on to a rotating vane feeder dropping on to one of the series of coke-conveyor belts, which convey it up into the metallurgical screening station. Here it may be dropped into cars, screened for either foundry or furnace use, or crushed and sent to the domestic screening station. For foundry use, it is passed by a picking station and then over a revolving screen and loaded in cars. For furnace use, the coke is passed over a bar screen spaced considerably closer than the parts of the rotating screen, and elevated by belt into open cars. The finer coke from the metallurgical screens, together with the breeze, is then carried to the domestic screening station, where it is separated into various sizes by means of rotating and shaker screens, and is then dropped into bins ready for loading. A belt and bucket elevator lift any small coke and breeze made while loading from the ground level to the upper floor, where it is again fed to the screening apparatus. Three box car-loaders running upon tracks adjacent to the two screening stations alluded to complete the equipment.

In storing coke, the entire charge is diverted into open cars, and then transferred to a large coke-pit. The 110-feet radius crane already referred to removes the coke from the pit to the storage heap and reclaims it, loading it in hopper-cars, from which it is taken by belt-conveyors to the screening plants to be screened for shipment.

The Bye-Product Building.

Separate rich and poor foul-gas mains conduct the gas from the collecting mains to the condensers and exhausters. The exhausters, besides maintaining an even pressure on the foul-gas main, force the gas through tar-extractors, ammonia washers, benzol washers, purifiers, station-meters, and then into a 1 million cubic feet holder.

In the four water-cooled condensers, temperature regulators, which may be set for any desired regulation, control the water-supply valves, by means of compressed air admitted through a pilot-valve actuated by a thermostat. Recording thermometers give a complete record of the temperatures maintained for each period of 24 hours.

The exhausters are of the positive rotary type, driven by simple condensing engines, which exhaust steam at 15 lbs. pressure for use in the ammonia concentrators.

For removing tar from the gas three extractors were installed, which are a modification of the "P. & A." design. A large spider-frame closed at the top, and having six sets of perforated vertical plates forming the sides, is suspended in a totally enclosed high cylindrical steel tank. Five drain-pipes for the tar are provided at different levels on the outer shell, so that the tar may be kept at different heights, and the spider plates on the inside sealed accordingly. For finer adjustment, the spider, carrying the perforated plates, may be raised or lowered by an outside screw acting through a fulcrum, on a rod passing through a stuffing-box to the inside, to which the spider is attached. Gas is admitted to the extractor at the bottom, and is conducted in a vertical pipe brought up above the tar-level, and made to impinge upon the perforated plates (at any velocity desired) by adjusting the area of perforations exposed above the tar-level.

Three ammonia scrubbers of the bell type are in use, each composed of twenty cast-iron sections, built up one above the other, eighteen of which are active. Each section is divided, with respect to the washing liquid, into six long compartments having two bells and an overflow; the overflow on alternate corresponding compartments being placed at opposite ends, and at such a height that the high point of the serrations on the bottom of the bells is immersed half-an-inch in water when sealed and ready for use. A large overhead tank in two compartments provides for the use of either fresh or very weak ammoniacal liquor for scrubbing at a constant head; and the compartments of the top section are provided with individual sight-feed glasses for aid in adjusting the water supply, which flows from the top down. Gas enters the bottom of the scrubber, and is made to bubble upward through the seals. The ammonia in the gas is gradually but fully absorbed by the descending water, which increases in ammonia strength on its way down, and drains away at the bottom through a seal to a small reservoir. The advantages of scrubbers of this type are that there are no moving mechanical parts, the scrubbers are easily cleaned and inspected, and the wear and tear is practically *nil*, as the parts are all cast iron and only subjected to weak ammonia water.

A tar and ammonia pump-room for flushing the collecting and foul mains and for handling and loading all tar and ammonia, also forms a part of the bye-product building. All tar and ammoniacal liquor removed from the gas flows to one of two small reservoirs, from which it is pumped to a large separating tank. After the tar and liquor separate, they flow by gravity into different large storage tanks provided for the purpose.

Ammonia Concentrators.

Weak liquor collected in the storage tanks is concentrated by two large ammonia stills, each capable of concentrating in 24 hours 60,000 gallons of weak liquor from a strength of about 1 per cent. ammonia up to 17 to 20 per cent. The stills, apart from the usual free and fixed ammonia stills, lime legs, and coolers, are provided with suitable superheaters, sulphuretted hydrogen and carbonic acid separators, dephlegmators, vapour condensers, and heat exchangers, all aiding towards most economical concentration. Exhaust steam from the exhauster engines, together with whatever live steam may be necessary, are used in heating the stills, and regulated in amount by temperature regulators. Fixed ammonium compounds are broken up with milk of lime furnished to the lime leg by a mixer, centrifugal pump, and constant head tank. Weak liquor to the stills is fed from an overflow tank through a meter to the sulphuretted hydrogen and carbonic acid separators, then in turn to the heat exchanger, superheater, free ammonia still, lime leg, and fixed still. The ammonia vapours from the still pass through the dephlegmator, cooler, and vapour condenser, and drain by gravity to storage tanks outside the building, from which it may be loaded into cars by compressed air. An auxiliary plant for the extraction of benzol is now in process of erection, and shortly will be placed in operation.

Other Plant.

Sulphur in the form of hydrogen sulphide in the gas is removed in two sets of open air oxide steel purifiers, each set composed of four boxes having a layer of 5 feet of material. The boxes are piped so as to permit their use in different consecutive series, but are not designed for reversal of flow.

In the pumping-station are three wet station-meters, for measuring the gas just before entering the holder. There also are installed two positive blowers, direct connected to steam-engines, used in pumping the gas from the station to the high-pressure system. The exhaust steam from the engines will be used for heating the holder during the winter months.

The holder, which has three lifts and a total capacity of one million cubic feet, is entirely of steel, with the tank above ground. Three gas connections are provided. All gas made is admitted to the holder through one connection; the second is used for high-pressure pumping; the third is provided for low-pressure distribution, so that no pulsation from the high-pressure blowers will affect the low-pressure system.

Steam and electricity for operating and lighting the plant are generated in a large and substantial structure built without a basement, and containing up-to-date and economical plant. A convenient machine-shop and office buildings complete the new works.

"B.TH.U." LOSSES ON COMPRESSION.

American Experiences.

At the last meeting of the New England Association of Gas Engineers, Mr. Willard O. Brewer, the Chemist of the Meriden Gaslight Company, of Connecticut, contributed a paper entitled "British Thermal Heat Losses with Medium Pressures;" and the text of it has been appearing in the pages of our New York contemporaries, together with some of the discussions to which the reading of it gave rise.

Mr. Brewer said: An increasing demand for a heat standard in place of, or in addition to, the present light standard, has led to much investigation to determine the advisability of such a change. On the part of the consumer, the question is whether as good service will be obtained, and whether it will eventually result in lower prices; while the manufacturer desires to learn the relative difficulties, and the cost of manufacture and distribution, under the two standards. The Meriden Gaslight Company have maintained a calorimeter in the laboratory for the past two years, and heating values of the carburetted water gas and mixed gas have been determined daily at least, as well as the candle power. In the manufacture, apparently no more difficulty need be met with in the use of a heat standard than in the use of a light standard; while as to the effect of distribution on the heating value of our gas, no data had been obtained.

In order to learn the loss due to compression and transmission, the gas which underwent the most severe conditions was taken. A medium pressure 6-inch line supplies the village of Southington, eight miles from Meriden; and branching from this is a 6-inch line which supplies Cheshire. During November last, at the time of the tests, the consumption of the district was between 55,000 and 65,000 cubic feet daily. The gas was subjected to a pressure of from 7 to 100 inches water, depending on the consumption. The line to Southington crosses five short bridges, but is well protected from low temperatures. A calorimetric testing-station was located at the gas office in Southington; and in Meriden the testing was done in the laboratory at the works, about 10 feet from the holder from which the gas was drawn to send over the line.

The outline of tests included at Meriden a determination of candle power, B.Th.U., dew-point, benzol, and illuminants, and at Southington a B.Th.U., dew-point, and the collection of samples of gas for analysis at Meriden. The chief difficulty was the obtaining of the same sample of gas at both places. Estimation of the contents of the mains gave 20,000 cubic feet, outside of the services. The fact that the main was in the form of a T, and that there was no way to tell how much each branch consumed, made exact calculation impossible. Finally, the figure of 17,000 to 20,000 cubic feet was taken to be the amount to be passed through the meter from the time of the test at Meriden to the time of the test at Southington. Thus, tests made in Southington in the middle of the afternoon were on, approximately, the same gas as was tested during the last part of the morning at Meriden. Because of the uncertainty as to whether the samples were of the same gas, the daily results are not strictly comparable; and the average of several tests, covering as many days' seems best to show the actual conditions. Not only so, but the gas was subjected to the greatest pressure of the day—due to the greatest consumption then and the necessary speeding-up of the exhauster.

The following are the results obtained:

Effect of Pressure on Heat Value.

Meriden.				Southington.		
Dew Point Deg. Fahr.	Candle Power.	B.Th.U.	Inches Water Pressure at Exhaust Outlet.	Dew Point Deg. Fahr.	B.Th.U.	Inches Water Pressure.
53	17·70	588·3	100	50	589·3	45
54	17·40	602·0	100	49	594·3	45
54	17·94	601·8	84	50	606·9	45
54	17·88	621·5	84	48	608·3	50
56	17·91	617·5	84	53	608·7	50
57	18·52	618·2	84	50	614·4	50
52	17·87	615·5	84	52	613·8	50
55	18·28	610·2	84	51	604·7	50
52	18·24	616·5	84	47	619·1	50
55	17·20	614·4	62	52	613·3	35
55	16·84	601·5	62	50	598·0	40
48	17·52	611·2	60	46	620·1	40
50	16·56	597·8	62	44	597·6	45
52	17·30	603·1	60	46	596·4	35
50	17·14	600·6	60	47	596·8	45
48	17·31	612·9	60	41	600·6	45
52·8	17·60	608·3		48·5	605·1	Average.

Analysis of Gas Samples for Illuminants.

Meriden.		Southington.		
Per Cent. Benzol.	Per Cent. Illuminants.	Per Cent. Benzol.	Per Cent. Illuminants.	
1·10	5·65	1·00	6·05	
1·20	7·75	0·65	7·70	
1·55	7·80	1·00	7·70	
1·15	7·65	0·75	6·75	
1·30	8·05	1·00	8·20	
1·30	7·65	1·00	7·25	
1·25	7·50	1·10	7·30	
1·25	7·75	1·20	8·40	
1·25	6·10	1·20	6·50	
1·30	7·40	1·25	6·45	
1·55	7·75	1·05	7·35	
1·29	7·37	1·02	7·24	Average.

Gas analyses were not obtained every day. They are placed separately, because it was deemed they were not necessarily on the same gas as the other tests, but indicated, nevertheless, a good average of relative changes in benzol and illuminants due to compression and transmission.

Note that the loss in B.Th.U. amounts to 3·2 B.Th.U., or 0·52 per cent.; while the benzol loss is 0·27 per cent., and that of illuminants 0·3 per cent. It is regretted that candle power determinations could not be made at Southington, as undoubtedly the light loss would have been much greater than the heat loss.

The calorimeters used were a Sargent (loaned to us by the New Haven Gaslight Company) and our own—a late type of Hinman-Junkers. Preliminary to the tests the meters, which had been standardized by a one-twelfth cubic foot bottle, were checked against each other and found to indicate the same. Average tests on the same gas showed that the Hinman-Junkers calorimeter gave 0·3 per cent. higher results. The water (which was furnished by overhead tanks, and was at nearly room temperature) was weighed. The calorimeter thermometers were standardized.

Candle powers were read on an 80-inch closed-bar photometer with a two-candle standard, in a Sugg "D" low-cone burner. Comparisons of this burner with a 7-feet Bray's "Special" and a Bray's 8-feet economizer slipped over a 3-feet regulator, on the same grade of gas as used in the tests, showed the 7-feet burner as 1·000, the 8-feet as 1·044, and the Sugg "D" as 1·122—or, for a 17·60-candle power by the Sugg "D," as in the average of the tests, the 8-feet burner would give 16·38-candle power, and the 7-feet 15·69-candle power.

In analyzing the gas, a water-jacketed Hempel burette, connected permanently to the pipettes by a "battery of stop-cocks" (branch tube) was used. The benzol absorption was made over mercury in a single pipette full of rubber tubes stretched over glass rods. After taking out the carbon dioxide and oxygen, the illuminants were absorbed by a saturated solution of bromine water. The Southington samples were taken in regular glass sampling tubes, and transferred to the Hempel apparatus for analysis.

In the course of the discussion as appearing in the "American Gas Light Journal,"

Dr. Beardsley said: The New Haven Gaslight Company have made some similar tests. We have for years supplied gas to an outlying town, distant about ten miles from New Haven. At first gas was delivered to this territory under a distribution pressure of about 3 inches, but in December, 1910, the supply was reinforced by a high-pressure booster line carrying 2 lbs., which feeds into the low-pressure system 4·6 miles from the works. This line passes over several bridges, and is subject to exposure. It was thought desirable to learn what deterioration in candle power and heating value the gas underwent in midwinter, as a result of this travel and exposure. A photometer room was built in the distant town, and fitted with a 100-inch bar and a standard calorimeter outfit. Tests were carried on during the winter of 1909-10, when the gas was supplied under low pressure, and also during the winter of 1910-11, when at least part of it had been subjected to 2 lbs. pressure. Readings were taken in the late afternoon and early evening, when the consumption was greatest. The gas was about 38 per cent. coal gas and 62 per cent. water gas. The tests in New Haven, against which comparison is made, were taken at the main office, almost a mile from the works. Tests taken at the works were higher than those at the city office. The results are given below. Station "A" is the Company's regular testing-station at its main office; Station "B," the temporary testing-station ten miles distant.

1909-1910.

Date.	Ave. Tem.	Sta. A C.P.	Sta B C.P.	Loss C.P.	Sta. A B.Th.U	Sta. B B.Th.U.	Loss B.Th.U.
Jan. 27-Feb. 14	28·5	20·10	16·65	3·45			
Feb. 15-Mar. 16	35·0	19·44	16·23	3·21	641·8	599·5	42·3
Mar. 17-31	46·2	20·34	18·27	2·07	654·7	617·0	37·7
Apr. 1 2	55·0	20·13	19·02	1·11	649·5	630·0	19·5

1910-1911.

Date.	Ave. Tem.	Sta. A C.P.	Sta. B C.P.	Loss C.P.	Sta. A B.Th.U.	Sta. B B.Th.U.	Loss B.Th.U.
December	26·4	19·53	17·52	2·01	642·1	612·4	29·7
January	32·1	19·92	17·66	2·26	640·2	617·9	22·3
February	28·2	19·73	17·75	1·98	643·6	613·5	30·1
Mar. 1-16	33·4	19·66	17·32	2·34	639·7	610·0	29·7
Mar. 17-31	38·0	19·86	19·58	0·28	639·5	628·0	11·5
April 7	52·0	20·89	21·52	+0·63	650·0	656·0	+6·0

A few samples were collected at Station "B" in February, 1911, and analyzed. They show a loss of benzol vapour of about 1 per cent., as compared with the gas at Station "A." A sample taken on April 7 showed the same quantity of benzol in the gas at both places. In the latter part of March, the loss of lighting and heating power diminished to zero. After April 1 there is a slight gain, due to the fact that some of the benzol condensed out in the main re-evaporated into the gas with the coming of warmer weather. We found at this works much greater loss than Mr. Brewer found. This is principally due to the fact that our tests were made in mid-winter instead of the fall; and our gas was somewhat richer than Mr. Brewer's. No greater loss was found the second winter, when nearly all the gas supplied had been subjected to 2-lbs. pressure. Comparison of the gas is here made, not against gas at the works, but against that which has already travelled about a mile, through very active trunk mains, and without unusual exposure. We conclude that the effect of long travel, with severe exposure to low temperature, is more serious than that of moderate compression. Theoretical considerations would point in the same direction. If we were dealing with a gas saturated at 50° with the vapour of pure benzol, compression to 2 lbs. would diminish the benzol present by about 12 per cent., while cooling to 32° would diminish it by about 47 per cent. These figures cannot be applied strictly to ordinary conditions, because the so-called benzol vapours in gas are not those of pure benzol. In considering the necessity of delivering gas of a required quality at a distant point during the winter, it would seem of more importance to consider the effect of exposure than of moderate compression.

Mr. Shattuck: In conjunction with Mr. Klumpp, we made a number of experiments along this line. The general trend of our results was that the candle power loss would run nearly 30 per cent. from high compression, and the B.Th.U. loss from 3 to 5 per cent., with initials of 30 lbs. to 45 lbs. and final pressures of 20 lbs. to 25 lbs.—showing that we should work for a heat-unit basis when transmitting gas under high pressure.

Mr. Hinman: The most remarkable result is the very little depreciation the gas suffered in thermal units—only slightly over one-half of 1 per cent. The variation in candle power—almost 2 candles and about 10·6 per cent.—was about twice as great as the loss in heating power. The heating power variations were: 33·2 the highest, 5·3 the percentage. Again, the loss of benzol and illuminants given in percentages of the whole gas would show much better if calculated as percentages of the total amount of benzol and illuminants. Calculated this way, the loss of benzol in going from Meriden to Southington was 21·7 per cent. reckoned on the total amount of benzol in the beginning. The percentage loss in illuminants was much less, 1·71 per cent., which shows considerable loss in the benzol and little in the illuminants. The heating power fell off almost nothing.

Mr. Norcross: We are now in negotiation with the Public Utilities Commission with a view to the establishment of rules and regulations for gas service; and some of our friends who are not exclusively devoted to gas, also have electrical rules under consideration. The Commission undertook this work through an expert (Professor Knowlton, of Trinity College), and started nearly a year ago to get ready for this schedule. He has gone into it carefully, and with a fair and open mind. We now have laid before us tentative rules, with a view to provoking our discussion and criticism. We have something which has stamped upon it the intent of fairness and reasonableness; yet when we go into the details we find a great many things we feel would be impracticable. The proposed standard is heating power only, and for 575 B.Th.U. The Commission, in the course of the first meeting for discussion, suggested that they believed they made a mistake in not making it 600 B.Th.U. A Committee was appointed to make it more convenient for the Commission to talk things over, and the experts to confer; but the last thing the Chairman of the Commission said to us before breaking up was: "I want to ask you, gentlemen, particularly to consider my suggestion that this standard be made 600 B.Th.U. instead of 575 B.Th.U." His ground for asking this was that the figures they had showed that most of the companies had been supplying 600 B.Th.U. or higher, and we have got to persuade him there is some real reason for making it 575 B.Th.U.

Mr. Klumpp: The subject of heating value is still in its infancy. We studied first the methods of testing for heating value; and I believe we have it standardized and so specified that consistent results may be obtained. But what can be produced and transmitted is a different question. Many have the idea that the heating value of a gas can be given if the candle power is known; but this is not true. The figures presented by the two gentlemen who have spoken on this subject are interesting; but the records of individual tests cannot be used to determine conditions existing at any other plant, unless the conditions were reproduced with a gas having exactly the same characteristics and treated the same way. Illuminating value losses are very irregular, because one has at many times a very unstable or tender gas. Similar conditions exist with heating value, but not to the same extent. If we are to give figures of loss in heating value for a gas distributed at low pressure or high pressure, in cold or warm weather, we must know the quantity of materials used in the manufacture of the gas, the heats carried, and the method of treatment during manufacture. If two water gases are made, one with an efficiency of 5½ candles per gallon, the other with an efficiency of 6½ candles, one must not expect the same losses in transmission. The same may be said of coal gas—large yields per pound and high candle power represent a gas that will not carry so well as that produced with lower yields and lower candle power. The former has a larger percentage of the benzol series that will deposit with high pressure, low temperature, and frictional scrubbing. The quantity of these vapours that a gas will carry is dependent on certain laws of vapour tension. So if you compress a gas to 15 lbs., you are putting 2 cubic feet of gas in the space of 1 cubic foot; and if the gas was previously saturated, you cannot expect to carry more than one-half of the vapours. If you freeze the gas or greatly lower its temperature, you also lower its carrying capacity for these vapours. From the figures given in this paper you will note a loss of only 3 B.Th.U. The calorimeters may vary this much—only one-half of 1 per cent.—so we might say that the heating loss was negligible. It is unfortunate that the illuminating value readings were not taken at Southington; so that the loss in candle power could have been determined. But the readings would have had to be made under exactly the same conditions and with the same burner. In Mr. Brewer's paper the readings on different burners are compared so that each one may draw his own conclusions from the type of burner used. A different gas would give results at variance with these figures. The calorimeter readings would be more consistent; and when the hydrocarbon vapours are lost, and a drop in heating value is noted, you generally count upon a drop in illuminating value—say, a loss of each 7 B.Th.U. equalling a loss of one candle. In summer you can at times transmit gas under pressure for some distance with little loss, especially if the gas contains but a small percentage of hydrocarbon vapours; but if the percentage of these vapours is high, a corresponding loss will be experienced. If we compress a 22-candle power carburetted water gas, made under normal conditions, to (say) 40 lbs., and deliver seven miles, there will probably be a loss of 6 candles and a drop in heating value of about 40 B.Th.U., or (say) 7 B.Th.U. per candle. Dr. Beardsley's figures show a loss of 10 to 12 B.Th.U. per candle loss. This, to me, indicates that his candle-power readings were too high at the low-pressure end. The benzol and its homologues are responsible for the greater part of this loss. The vapour tension of the toluols and xylols being low, they drop out first and carry down the benzols with them. If these are all scrubbed out and benzol alone added afterwards, ordinary compression and cooling will affect the quality of the gas to a small degree, as the compressed and cooled gas will carry enough benzol to hold up its illuminating value. This is an expensive method of enrichment, and at present is to be avoided. In our argument before State or governing authorities in favour of low illuminating value gas, we should bring up the fact that what we want first is a gas that will give the best service to the consumer, and a tender gas will not give this service. The New Haven tests show that the richer gases are tender and the upper candles are not permanent. With a rich tender gas, you cannot over-adjust or under-adjust an atmospheric burner without trouble—especially an inverted incandescent burner. In other words, the limits for good adjustment are very narrow, and any slight variation in quality or pressure produces carboning or roaring. When such a gas is compressed and cooled and transmitted some distance, these difficulties are removed, because the higher candle power or tender part of the gas has been eliminated, or the quantity of hydrocarbon vapours reduced, or, as an engineer has expressed it, the "trouble zone has been eliminated." This zone occurs in gas made on efficient processes, from 580 to 650 B.Th.U. or higher; with coal gas of over 15-candle power (argand); or water gas, over or about 18-candle power. A gas may possibly be made of qualities above these figures containing a small quantity of hydrocarbon vapours; but such a gas would be inefficient in the use of materials, or require selected or higher price materials. If we could supply at all times a gas of from 550 to 580 B.Th.U., and make no effort for high candle power, and deliver it at good pressure—say, never below 4 inches—we would never have a service complaint. A moderate variation in pressure would not cause carboning or back-firing. The Germans and English understand this, although their pressures are still too low. Their standard requirements of from 500 to 540 B.Th.U. have completely eliminated the trouble zone, and given the best service to their consumers.

Mr. Arthur Hewitt: We have been working in Canada for four years with the Government. Two years ago the Department of Gas and Electricity at Ottawa sent a Commissioner to England for the purpose of investigating the conditions under which gas was manufactured there. He was convinced that we were right in our contention that the candle power standard should be abolished and a reasonable standard of calorific value substituted; and when I tell you that we were working for 500 B.Th.U. gross, 575 B.Th.U. looks a very high figure. Unfortunately, he came across the line into the United States and got somewhat mixed up. He went back inclined to steer a middle course somewhere between the chaotic confusion of standards on this side and the fixed low standard prevailing on the other side. Recently I had a number of interviews with the Government, and had the pleasure of settling the condition that compromised between the Government Commissioner's report and what we were asking for. I find that the new standard to be fixed by the Government for a calorific value of the manufactured gas to be supplied in Canada, is to be not more than 540 B.Th.U. per cubic foot, and that no company will be subject to any penalty unless the calorific value of their gas should fall below 515 B.Th.U., or the average during any month falls below 525 B.Th.U. I am interested in getting protection for ourselves by not having anybody else get too far astray from the proper line. I would caution you that you do not accept offhand the report of the Joint Commission recommending 575 B.Th.U. as a standard, because they will back down from it very shortly. The argument that has been put up for 575 to 590 B.Th.U. by the previous speaker will lead you down to 500 B.Th.U., I am convinced. The recent decision in the case of the Gas Light and Coke Company of London makes a standard of 540 B.Th.U., but allows a variation of 7½ per cent., which brings it down to 499½ gross as the real standard of the Company; and this discussion should weigh heavily with those who are considering this matter from the Commission standpoint, with this exception: In England probably 80 to 85 per cent. of gas is coal gas and the rest carburetted water gas; in the United States almost the reverse of these figures is the case. But I am convinced that the conditions under which gas is commonly used by consumers differ so largely from the conditions that prevail in testing with the calorimeter that it has very little bearing upon the subject. How will the consumers get the benefit of the saving brought about by the lowering of the standard? If you are able to economize in the manufacture of gas, the public will eventually get the benefit of it. In Toronto they get it all. We do not, as a gas company, have any chance to profit, because we have a fixed condition as to dividend, and the public gets all the surplus; we cannot make any more money anyway. But, from a purely public standpoint, it seems to me there is nothing to be gained by getting the standard very far above 500 B.Th.U. Three years ago we got into very serious trouble because we undertook, regardless of the fact that we had a 16-candle power standard, to carry through a winter season some experiments to see how low we could go before anyone would know the difference. Nobody would have known it if somebody on the inside had not mentioned that something was being done. We stayed with it for three months and came out all right; and I do not think anything was so impressive upon the Government Department as the investigation it made at that time to see to what extent the variation in the B.Th.U. value of gas would affect the consumers. I went on a long way down the scale, because it was information we were after. We came to the conclusion that other people's finding did not help us very much. Supported by the arguments of the very highest grade of gas men in England and Scotland, we convinced the Government that a reasonably low standard should be fixed for the gas supply—to say nothing of the necessity for competitive advantage against the lowering of electric rates. I contend that we were right, and that we were working in the public interests, in seeking a lower standard rather than the high standard that had prevailed for so long, and which had produced so much economic waste.

Mr. Hinman: The question of an official standard for gas has come up rather unexpectedly. Perhaps some of those present know that for twenty odd years I was the Inspector for the State of Massachusetts, and had, of course, to look after the standard; and since that time I have given considerable attention to it. In my opinion, inspection and publicity are about all that are necessary for gas regulation. Public sentiment will take care of the rest. I am very doubtful whether it is advisable to have any standard whatever for heating or lighting value—simply inspection and immediate publicity. The gas company in any given place knows better what value it can give than any board, commission, or inspector.

A paper, entitled "Gas Producers at Collieries for Obtaining Power and Bye-Products from Unsaleable Fuel," will be read by Mr. Mansfeldt H. Mills at the twenty-sixth annual meeting of the Institution of Mining Engineers, at Leeds, on Sept. 15 and 16.

An official report on the war, issued from Paris yesterday (Monday) week, stated: "The enemy having again dropped some shells on St. Dié, we fired on the gasometers of Ste. Marie-aux-Mines, causing an explosion." This station does not belong to either the Imperial Continental Gas Association or the Continental Union Gas Company.

ASH CONTENT AND COKING PROPERTIES.

A patent specification which has been recently issued, describing an invention of Mr. T. M. Hickman, claims to furnish a method of conversion of non-coking fuels into coking fuels.

Researches into the causes of coking have previously led to the conclusion that some of the organic constituents of the coal, of a resinous nature, were responsible for the coking property; and the published results of many investigators—notably those of Burgess and Wheeler—have all tended to confirm this conclusion. Indeed (writes the "Iron and Coal Trades Review"), we were just beginning to think that at last we did know a little about the causes of coking, and that the ultimate complete solution was only a matter of time and patience. But it seems that all these theories regarding resinous constituents are absolutely wrong; for according to Mr. Hickman, "the coking qualities of carbonaceous materials are primarily due to the presence of mineral compounds—notably aluminium and silica—containing in chemical combination therewith alkalies or alkaline earths, magnesium or iron, or such other metals as can take the place of, and have the same effect in the combination as, iron, and in such quantities as to obtain the property of great permeability and comparatively low fusibility, and of keeping the particles of the coke formed bound together." According to this theory, the higher the ash the greater the coking properties; and an explanation is at once afforded of the coking properties of clinker or blast-furnace slag.

TIME FACTOR IN OIL-GAS MANUFACTURE.

As the result of an elaborate theoretical and experimental investigation (described in the American "Journal of Industrial and Engineering Chemistry"), Messrs. M. C. Whittaker and C. M. Alexander have arrived at certain conclusions which may be noted with reference to the manufacture of oil gas. Four variables were considered—time, temperature, pressure, and concentration; but it was recognized that the time factor, which can be controlled by a variation in the rate of oil-feed, offers the most ready means of studying the attainment of chemical equilibrium, and apparatus was designed which would enable all the other variables to be kept constant during any one experiment. The deductions are as follows.

The control of the composition of the products obtained in the manufacture of oil gas involves not only thermodynamics, but also chemical kinetics.

In practice, equilibrium is not reached in the thermal decomposition of petroleum hydrocarbons. This is proved by the fact that a recirculation of the products, under the same conditions at which they were generated, results in a further change in composition.

The time factor, which is controlled by the rate of oil-feed, is just as important as are the other variables (temperature, pressure, and concentration), as it has been found that the compositions of the products obtained in making oil gas vary with the rate of oil-feed. Hence, from the standpoint of practical operation of an oil-gas plant, the rate of oil-feed offers an easily accessible means of control.

Maximum and minimum percentages of the various constituents in the products formed by the decomposition of petroleum and petroleum distillates by heat can be obtained by a proper adjustment of the variables.

Petroleum hydrocarbons can be completely decomposed into carbon and hydrogen only within well-defined limits of the four variables. In the investigation, the range of complete decomposition at a definite temperature and pressure was limited by the definite rates of oil-feed.

Oil gases containing equal percentages of illuminants can be produced at different temperatures by varying the rate of oil-feed. Such gas mixtures, though they have equal percentages of illuminants, do not in general have equal percentages of saturated hydrocarbons and hydrogen—*i.e.*, gases of equal illuminating values are not necessarily of equal thermal values.

In an isothermal decomposition of petroleum hydrocarbons, maximum yields of gas and minimum yields of tar are characteristic of equilibrium compositions.

Natural Gas in Canada.—Throughout the entire length of the intercolonial railway of Canada, running from the Atlantic seaboard to Montreal, the passenger cars are, says the "Journal of the Society of Arts," lighted with gas from the New Brunswick natural gas fields—the product having been successfully used in place of the Pintsch gas, with which the lights were formerly charged. Gas is also used exclusively as fuel and for power generation in the car-shops at Moncton; over 30 million cubic feet having been consumed in September last year. The steady and reliable heat, according to the report of the Canadian Department of Mines, makes it an ideal fuel for forges, furnaces, and gas-engines; no time is wasted in firing up; and there is a considerable saving in expenditure. The gas from the Canadian Pacific Railway well at Medicine Hat is bottled in steel flasks, 8 inches in diameter and 50 feet in length, and is shipped for use in lighting the cars. The pressure of the "bottled" gas is 1700 lbs.

EFFECT OF SPRINGS UPON WATER-LEVELS IN THE CHALK OF EASTERN SURREY.

By Henry Dewey, F.G.S.

[Extracts from a Paper read before the Institution of Water Engineers.]

The paper deals with an area of some 30 square miles situated in north-east Surrey between Epsom and Croydon. Most of this country consists of chalk; but a narrow strip along the northern edge is formed by the sands, loams, and clays of the Tertiary beds; and some plateaus and isolated hills on the east are capped with thick masses of pebbles.

The area is separated into two districts by a deep narrow valley in which the town of Croydon has in great part been built. On the west the ground is gently undulating with a general northerly slope; the fields being wide, bare, and exposed, contrasting in this respect with the deep sheltered dales and wooded hills lying to the east of the main valley. This change is abrupt and conspicuous; and when its cause is sought, the importance of the beds of pebbles mentioned previously is realized. The abrupt change of topography and scenery is due to the oncoming of these pebble-beds. They are permeable to rain, and form an arid and poor soil suited to the growth of pine-trees and heath; and the wild moor-like commons at Shirley, Hayes, and West Wickham are due to these beds.

The levels of the water in the many deep wells have been recorded by several observers, including the Croydon Water Authority, and these results have been published from time to time. Lucas was the first observer to give details; and his figures are useful for purposes of comparison with present-day records. Among later records, the figures published in the "Memoirs on the Water Supply of Surrey, and on London Wells," furnish useful data. Perhaps one of the most important facts observable from an inspection of the data is the complete indifference of the water to the dip and character of the beds of chalk. To illustrate this point several series of wells along the dip-slope have been taken. The results are as follows:

Table showing Dip of Chalk, Gradient of Water-Level, and Ratio of Dip to Gradient, between Localities given.

Section A runs from Woodmansterne Rectory (**20**) *through Woodmansterne Village* (**21**) *and Banstead Asylum* (**10**) *to Belmont Workhouse* (**12**).

	Between 20 and 21. Feet.	Between 21 and 10. Feet.	Between 10 and 12. Feet.
Dip of chalk	1 in 51	1 in 51	1 in 37
Gradient of water-level	1 in 108	1 in 220	1 in 388
Ratio	1 to 2	1 to 4	1 to 10

Section B runs from Red Lion (**51**) *through Woodcote Grove* (**54**) *and Little Woodcote* (**22**) *to Barrow-Hedges* (**16**).

	Between 51 and 54.	Between 54 and 22.	Between 22 and 16.
Dip of chalk	1 in 91	1 in 45	1 in 51
Gradient of water-level	1 in 94	1 in 170	1 in 618
Ratio	1 to 1	1 to 4	1 to 12

Section C runs from Stoat's Nest Farm (**50**) *through Great Woodcote* (**27**) *and Woodcote Hall* (**52**) *to Hogpit, Carshalton* (**24**).

	Between 50 and 27.	Between 27 and 52.	Between 52 and 24.
Dip of chalk	1 in 67	1 in 41	1 in 34
Gradient of water-level	1 in 119	1 in 180	1 in 300
Ratio	1 to 2	1 to 4	1 to 10

Section D runs from Kenley (**38**) *through Roke Farm* (**32**) *Russell Hill* (**28**) *and New Barn Farm* (**29**) *to Carshalton* (**24**).

	Between 38 and 32.	Between 32 and 28. (24).	Between 28 and 29.	Between 29 and 24.
Dip of chalk	1 in 91	1 in 30	1 in 35	1 in 63
Gradient of water-level	1 in 180	1 in 177	1 in 200	1 in 760
Ratio	1 to 2	1 to 6	1 to 6	1 to 12

If the range of fluctuation of the water-levels be considered, a very remarkable difference is seen to exist between the groups of wells situated respectively east and west of the Croydon Valley. This is indicated in the following tables, which show the annual range of fluctuation in feet for both wet and dry years.

Range of Fluctuation of Water-Levels in Surrey Wells.

	Dry Years. Feet.	Wet Years. Feet.	West of Croydon.
	5	16	Great Woodcote (27)
	3	9	Woodmansterne Village (21)
	5	16	Little Woodcote (22)
Average	4⅓	14	
			East of Croydon.
	20	76	Slynne's Oak (42)
	9	36	Addington Lodge (45)
	19	53	Selsdon Well (43)
Average	16	55	

From these figures it is seen that the range of fluctuation of the water-level remains constant in the wells both of the western and eastern district; but the two groups differ widely from one another. There is nearly four times as great a range in the wells on the east as there is in those on the west; the figures being $4\frac{1}{3}$ feet and 14 feet on the west, and 16 feet and 55 feet on the east.

As to the causes of the difference, the supply of water is, in both cases, the rainfall. There are no published data relating to the percolation of rain over the area; but it is probably greater between Epsom and Croydon, owing to the bareness of the chalk, than it is east of that locality, where wide spreads of Tertiary beds and clay-with-flints form the surface. The impermeability of these beds would tend to increase evaporation and decrease percolation, and so equalize the amount of water entering the chalk of the two areas. The difference of fluctuation must, therefore, be due to the escape of water which has already penetrated the chalk. Pumping may cause some of the difference. But in Lucas's time there were not many pumps working; and the difference was then even more pronounced than now. There is, however, a very obvious source of exhaustion in the many powerful springs which gush out from beneath the Tertiary beds at Ewell, Carshalton, and Waddon. These emit annually many millions of gallons of water, and the continual drain on the underground resources must tend to lower the water-level permanently. The actual quantity escaping in recent years from these springs has not been gauged, or if it has the results are unpublished, so that Lucas's figures must be resorted to in calculating the effect upon the water-levels. According to Lucas, the amount of water which gains access to the chalk of the drainage-area feeding these springs is 89,229,388,800 gallons annually, equivalent to a daily average of 244,464,078 gallons; while the amount flowing away at the springs is 39,156,680 gallons, or, in other words, as much as 16 per cent. escapes annually. On the east of the Croydon Valley, there are none of these powerful springs; and all the water that percolates into the chalk flows down beneath the Tertiary beds and tends to raise the water-level over the whole catchment area.

The question of the cause of the springs is an obscure geological problem; but some significant facts may be mentioned. First among these is the faulted nature of the chalk near the outcrop of the Tertiary beds between Epsom and Croydon. Almost everywhere in this district when artificial sections are cut in the chalk small slips and faults are exposed, upon which water accumulates as drops, or sweats-out from the rock. Similar faults are seen east of Croydon, but not nearly so frequently. The chalk, however, is jointed; and it is along these joints that the underground waters flow rather than through the rock-mass itself.

Another feature of the western district is the presence of a series of shallow folds or undulations which lie on the main dip-slope. These increase in amplitude from Epsom to Sutton, where the dip is 10°, and decrease thence eastwards to Croydon, where it is only 1°. The dip of the main mass of the chalk is gently towards the north; but just beyond the outcrop of the Tertiary beds, it suddenly increases for a short distance, and thence flattens out into a gentle slope—thus forming a sort of step. This structure also ceases east of Croydon. All these structures are due to movements of the earth's crust, which resulted in the tilting and folding of the beds, while accommodating themselves to the smaller space they had to occupy on account of contraction; and the beds which suffered most deformity were those which are now exposed on the west side of the main valley. It is significant that, with the oncoming of the massive pebble-beds on the eastern side of the Croydon valley, the deformity and faulting of the chalk diminishes in amount, and the emission of springs ceases. There can, therefore, hardly be a doubt that the phenomena are correlated, even if the absence of springs is not consequent upon the presence of the pebble-beds.

The chief points of the paper may be summarized in these words: Two contiguous areas differ markedly from each other in the movements of their subterranean waters. This difference is caused by the emission of springs in one area and their absence in the other, which in turn is due to differential effects of folding and faulting of the rocks of the two districts, and by the presence of massive beds of pebbles on the east, and their absence on the west. The rise and fall of the underground water in the eastern district is about four times as great as that in the western district; while the amount of water escaping at the springs is equivalent to one sixth of that which percolates into the chalk over the catchment-area. From these figures it may be inferred that the underground waters follow defined channels rather than flow through the interstices of the mass of the chalk.

DISCUSSION.

The PRESIDENT (Mr. F. W. M'Cullough, of Belfast) said the members were much obliged to Mr. Dewey for his paper. It would be very interesting to those in the neighbourhood deriving their water supply from these particular strata. He proposed a vote of thanks to the author.

Mr. T. MOLYNEUX (Stockport) seconded the motion, which was heartily passed.

Mr. BALDWIN LATHAM said it was about fifty years since he first became associated with the district referred to in the paper. His first gaugings were made in 1866 in connection with a large boring flowing beyond the fault alluded to by the author, and escaping into the Wandle. There had not been such a large flow there since that time; and the question arose how it was these bourns had diminished in recent years. The view generally taken was that it was entirely due to the enormous amount of pumping that had taken place all round London. There were now established a number of water-works dealing with millions of gallons of water per day; and so naturally it was concluded that they could not now have bourns of such great capacity as those of former years. He proceeded to question the accuracy of the Lucas gaugings, supporting his contentions by figures. He also instanced the difficulties of making accurate gaugings, by alluding to the quantity of water escaping into the sewers, and passing away to the sewage farm. Further illustrating the care that had to be taken in making gaugings, he asked where did the deep London wells get their water from. There was no direct communication between the chalk and the London wells; and yet chemical analysis of the deep-well water exhibited certain similar characteristics. It had been shown by Dr. Thresh that water which flowed through the Thanet sands produced water corresponding to the water yielded by the London wells. He (Mr. Baldwin Latham) had gauged as much as 10 million gallons a day flowing out of the Wandle; and his belief was that this went to help to supply the deep London wells. This showed how very careful one had to be in making gaugings. During the large number of years that he had been gauging, he found on the average that about 40 per cent. of the rain passed off from the springs in the Croydon area, and not one-sixth. Averages were of no value in matters of this kind; they had to deal with the minimum, and the minimum was often only one-tenth of the maximum.

Mr. W. WHITAKER, B.A., F.R.S., F.G.S., pointed out that there was a distinct difference between the two areas referred to in the paper. It was not wholly a geological difference, but was partly a topographical one. As a matter of fact, the eastern area from the junction of the Tertiary beds and the chalk was what was called the high-level area, whereas the western area was the low-level one. This was one reason why they got the springs referred to on the west, but did not get them the same on the east. The springs did not rise to the high level. The result was the difference between the Croydon Valley and the Ravensbourne. They got no springs along the junction. Springs were obtained in the eastern area; but they were springs out of the Tertiary beds. The conformation of this area was due to the great mass of pebble bed referred to, which did not go beyond the Croham Valley. As to the decrease of the bourns, there was an enormous amount of water pumped out from east and west, which lowered all the levels. The bourns, however, still broke out, and water overflowed. Pumping went on; but this could not stop the bourns altogether. They might not be so big as they used to be; but they were large enough for all practical purposes. Take those that Mr. Latham gauged a little while ago. He gauged them once a week; and his highest gauging was 11,980,000 gallons per day, or something of that sort, despite all the pumping. When Nature took it into her head to give 3 or 4 inches of extra rainfall, it was quite enough to fill up all these bourns. Undoubtedly, there must be an effect from the pumping of the chalk; but this effect was not so great as some people imagined. Sometimes it was a large thing; but Nature was capable of dealing with it.

Dr. H. LAPWORTH (London) was inclined to think that the author's theory was the correct, or partly correct, one as to the causes of the fluctuations. It was very well known to pumping engineers that, if a pumping-station was put on top of a hill, there would be a fluctuation in supply; and the further one went away from a spring, there would also be greater fluctuation. This was the reason why on the eastern side of this area, there was a larger fluctuation than on the western side.

Mr. HENRY PRESTON (Grantham), also on the point of fluctuation, wondered whether it was possible for the wells in the chalk on the east side of Croydon to be in any way connected with the springs on the west side. As the author explained, there was some sort of fault on the outcrop of the Tertiary beds; and, if this continued across the valley, it was a question whether the water did not travel forward to the same outlet. It seemed to him possible that, having a common outlet, and the rainfall being common, the variation in the amplitude of the wells should be dependent upon the distance travelled, or the friction, in the rocks. He should like to know whether there was a possibility of the water on the east side being connected with that on the west.

Mr. DEWEY, in reply, said he was sorry he had to refer to Lucas's gaugings. He rather suspected they might be wrong; but he had no others to use. What caused the difference in the fluctuations of the wells east and west of the valley? The fluctuations were a fact, and they could account for them as they liked. Mr. Whitaker referred to the variations in the flow of the bourns being an effect of the pumping on the water-level. The water capacity of the chalk was limited; and he (Mr. Dewey) roughly estimated that 50 inches of rain would fill the chalk, so that it could not hold a drop more—that was, 50 inches spread over the year. With this rainfall, if the pumping diminished the amount of water in the chalk, annually the supply would be fully replenished.

Horley District Gas Company.—The Company's accounts for the last half year show an available balance of £1055 after providing for the fixed charges for interest; and the Directors recommend dividends at the rate of 5 per cent. per annum on the preference stock, 4 per cent. per annum on the "A" capital stock, and £2 16s. per cent. per annum on the "B" capital stock—all less income-tax. These will absorb £977. The works, mains, and plant have been maintained in good and efficient working order by the Manager, Mr. R. Seymour Tobey.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Conversion of Consols into War Loan.

Sir,—In the course of his speech at the half-yearly meeting of the Gaslight and Coke Company, Sir Corbet Woodall said [see "Journal," *ante*, p. 297]: "Among their investments, the Company have a sum of £221,000 in Consols standing to their credit at a book-value of 75 per cent. In view of the depreciation they have suffered, it was thought wise to write them down to £66 2s. 3d.—the figure at which, on conditions, they can be converted into the new war loan. This writing-down has cost some £18,000. With the assistance of the Company's bankers, arrangements have been made to convert the net amount into war loan; and the result will be a considerable increase in the yield of interest on this investment."

The majority of gas companies have their reserve and other funds invested in Consols. Many, no doubt, have also subscribed to the new war loan; and the question of exercising the option of converting a portion of their Consols has either been settled by them or will soon be under discussion. It is true, as Sir Corbet Woodall says, that an increased return to his Company will result from conversion. The terms offered by the Government have been widely accepted as generous. But how long the conversion will operate to the advantage of stockholders seems to be an open question. After ten years—any time between 1925 and 1945—the Government may redeem the 4½ per cent. war loan. And the writer of a pamphlet ("Keep your Consols") considers it "largely within the sphere of probabilities that by 1925 both the Money Market and the Investment Market will have recovered to such a natural position that the conversion of the present war loan, *plus* any future issue that may be necessary, will be possible on a 3½ per cent., if not on a 3 per cent., basis." If so, he asks, what will be the position of a holder of Consols who voluntarily converts to-day, and is compulsorily converted back to 3½ or 3 per cent. in ten years?

In considering the question, it must be remembered that, when the Government credit has again reached a 3½ per cent. basis, the present-day Consols will be quoted at about £71 7s. 6d. per £100 of stock, or on a 3 per cent. basis Consols will be quoted at about £83 5s. per £100 of stock. The writer submits examples showing the likely position in which holders may find themselves at the end of ten years, assuming that the additional interest is treated as capital (average rate of income-tax 2s. in the pound).

Example I.

A holder of £1000 nominal of Consols who converts will at the end of ten years (Dec. 1, 1925), have received 10½ years' interest at 4½ per cent. on £666 13s. 4d. of new stock.	£315 0 0
Less average tax of 2s. in the pound	31 10 0
	£283 10 0
Repayment of principal	666 13 4
	£950 3 4

Example II.

A holder of £1000 nominal of Consols who does not convert will, at the end of ten years (Dec. 1, 1925), have received 10¼ years interest at 2½ per cent. on £1000	£256 5 0
Less average tax of 2s. in the pound	25 12 6
	£230 12 6
Market value of Consols, Dec. 1, 1925, on a 3½ per cent. basis	713 15 0
	£944 7 6

Showing an apparent profit of £5 15s. 10d. in ten years.

Example III.

Taking, however, the market value of Consols on a 3 per cent. basis	£832 10 0
And the net interest as above	230 12 6
The resulting total of	£1063 2 6

shows to the converter a loss, which will be real, of £112 19s. 2d.

From the point of view also of revenue-earning, a Consol holder who converts to-day may find himself at the end of ten years in a worse position:

Holder of £666 13s. 4d. of new war loan (received in exchange for £1000 Consols) reduced to 3½ per cent. per annum—annual income 3½ per cent. per annum on £666 13s. 4d.	£23 6 8 gross
Holder of £666 13s. 4d. of new war loan (received in exchange for £1000 Consols) reduced to 3 per cent. per annum—annual income 3 per cent. per annum on £666 13s. 4d.	£20 0 0 gross
Holder of £1000 Consols who has not converted—annual income 2½ per cent. per annum on £1000	£25 0 0 gross

To an individual who desires an immediate increase in income, the conversion scheme has its attractions; but in the case of a company with perpetual succession, it is probable that in the long run it would be of advantage to retain its Consols. Some, notwithstanding any potential loss of capital, may, of course, from a patriotic point of view, choose to convert.

F. A. Gulland,
Accountant, Maidstone Gas Company.

Maidstone, Aug. 14, 1915.

Dutch Mantles.

Sir,—Will you permit me to add my quota of testimony to that of Mr. Garland, *re* above.

Having had personal experience of the German mantle industry since its inception, and studied its methods for the conquest of the British and Colonial markets, I should like to warn the British mantle manufacturers that patriotism ends with the pocket, and that alone will not win the world's markets for us. The public will not buy sixpenny British mantles if there are others at threepence; and for this reason we must now commence to cheapen our produce by imitating the German system.

We must have thorium made and owned by an association of British manufacturers; and we must have magnesia rings, collodion, &c., and all adjuncts for the manufacture of incandescent mantles, in the hands of manufacturers, in order to compete with Dutch, Swiss, Danish, or any hybrid pseudo German hirelings. Thorium can still be obtained at 28s. per kilo. in Germany; and even at this price the "ring" obtains about 200 per cent. profit. The British manufacturer has to pay £2 per kilo.; and there is only one firm who by Government favour can supply it, even at this price. Magnesia rings are unobtainable, as the only German firm in England is under the control of a few makers, while the "owner" is interned.

The emissaries of the Hun are already covering all our colonies with Dutch and Swiss mantles; and by the time the war ends "business will be as usual" in German hands. We have a perfect right to the trade of our own country and colonies—dearly bought by the best of British blood; and we must now commence to find effective means to keep our funds for our own kith and kin.

I suggest a strong association of manufacturers, without any oppressive methods or inquisitorial dictates, on the lines of the British American Tobacco Company; and we must organize a campaign by advertisements in the trade and public Press—giving cogent reasons for the support which is now more than ever necessary for the consolidation of our home finance. I shall be glad to act as Honorary Secretary; and my collection of proofs from the Fatherland will certainly open the eyes of our indifferent manufacturers.

M. H. Hersey.

Bethune Road, Amhurst Park, N., Aug. 18, 1915.

REGISTER OF PATENTS.

Removing Sulphuretted Hydrogen from Coal Gas.

Burkheiser, K., of Hamburg.

No. 1415; Jan. 19, 1914. Convention date, March 4, 1913.

The invention described in patent No. 16,172 of 1912 related, the patentee states in his specification, to a process for the absorption of sulphuretted hydrogen from gases by means of an alkaline solution containing ferric hydroxide in suspension, for regeneration of the alkali from the alkali sulphides formed, and also some sulphur for the purpose of enabling cyanogen to be absorbed and to form alkali sulphocyanide compounds. Regeneration of the ferric hydroxide from the sulphide is effected from time to time.

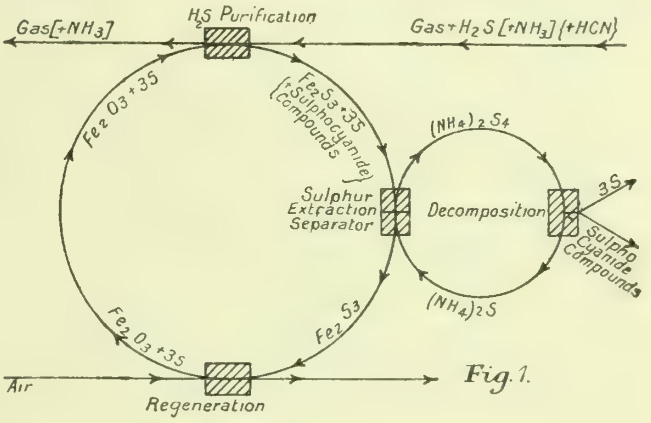


Fig. 1.

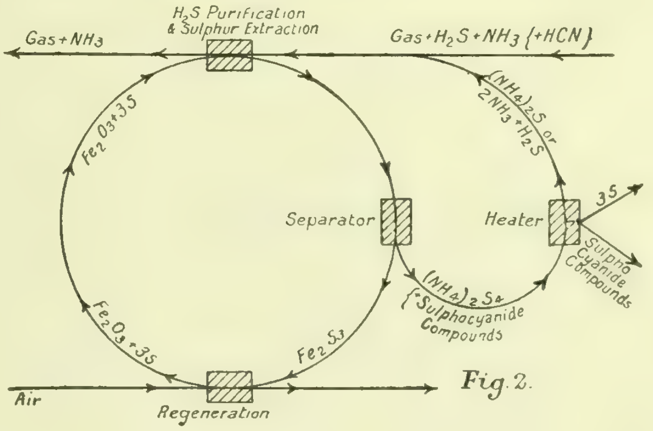


Fig. 2.

The present invention consists in a process for absorbing sulphuretted hydrogen in which the spent mass resulting from the purification, as described in the patent of 1912, is treated directly with alkali sulphides for the recovery of free sulphur by solution—the residual mass containing iron sulphide being oxidized so as to obtain a mixture of hydrated iron oxide and free sulphur for further use in the purifying process.

A method of working is described in which are employed for the gas purification an alkaline elutriate of metallic oxide—in particular, oxide of iron or hydrated oxide of iron—and sulphur. It consists in exposing the mixture of iron-sulphur compounds and sulphur then arising, before it is in any way oxidized, to the action of alkali (ammonium) sulphide, and then undertaking a separation of the liquid and the solid portions. These solid constituents then consist only of iron-sulphur compounds, which on their part are oxidized to hydrated oxide of iron and sulphur, and thus give rise to a similar mixture which has served as the primary material for the gas purification, and which can therefore again be employed for similar purposes. The result is a complete circular process. The sulphur is withdrawn by the alkali (ammonium) sulphide, out of the circulation of the purifying mixture, in the form of alkali polysulphide, and removed by some known means. The alkali (ammonium) sulphide is here solely a dissolving medium, and does not enter into any other combinations. Hence the alkali (ammonium) sulphide is recovered, and, after the removal of the sulphur dissolved in it, is again available as a solvent medium, so that a second circulation results. Moreover, since all the reaction products result from the operation of gas purification itself and continually arise anew on carrying on the two circular processes, the process is said to be extremely economical.

The further development of the process relates to a specially suitable method of working, for the purpose of removing the sulphur from the alkali polysulphides formed in the process, and recovering them as a valuable commercial product. This feature of the present invention is to heat the liquid containing the alkali polysulphides to a temperature of 90° to 100° C., at which temperature the alkali polysulphides decompose, with the separation of sulphur. In this operation sulphuretted hydrogen or sulphuretted hydrogen and ammonia are set free, while the sulphur sinks to the bottom in a flocculent, easily separable form, and can be separated from the supernatant liquid by filtration.

This method of working, it is claimed, is specially suitable, and to be recommended, for gases containing cyanide. For, in the above-mentioned process of sulphuretted hydrogen purification by means of an alkaline elutriate of iron oxide or hydrated oxide and sulphur, in the case of gases containing also cyanogen, the cyanogen is removed from the gas and taken up by the alkaline elutriate in the form of sulphocyanide compounds. The sulphocyanide compounds are then (as easily soluble compounds) dissolved in the liquid, and, after the separation of the liquid from the solid constituents, remain in the liquid, mixed with the alkali polysulphides.

If, now, the liquid is heated to the temperature at which the alkali polysulphides decompose with separation of sulphur, it is possible to recover the sulphocyanide compounds separately in a simple manner. This is said to be especially economical, because it renders possible the conversion of these sulphocyanide compounds into ammonia within the limits of the actual coal distilling operation, either by the employment of the process described in patent No. 15,977 of 1912 or by any other known means, and of thereby attaining quite a considerable increase in the yield of ammonia.

By this further development of the process, therefore, the impurities, sulphuretted hydrogen and cyanide, utilizable hitherto with difficulty (or not at all), are simultaneously with the purification of the gas recovered in the form of valuable commercial products—precipitated sulphur, sulphocyanide compounds, or ammonia—in the continuous operation of the actual coal distillation.

A further advantage of the employment of the present invention consists in returning the gaseous decomposition products (sulphuretted hydrogen, or sulphuretted hydrogen and ammonia) resulting from the recovery of the sulphur, with the decomposition of the polysulphides, into the process again—that is to say, into the stream of gas before its entry into the sulphuretted hydrogen purification apparatus. The sulphuretted hydrogen purification and the solution of the sulphur are then preferably accomplished in the same apparatus by regulating the quantity of iron used and by the length of time the gas is in contact with the washing liquid; so that all the oxide in the purifying liquid is converted into sulphide of iron in that portion of the purifying vessel into which the impure gas and the above-mentioned gaseous decomposition products enter. This enables the free sulphur to be dissolved by the above-mentioned dissolving agents or decomposition products entering with the gas—see diagram, fig. 2. Or the sulphuretted hydrogen and ammonia may be brought into contact with the mixture of iron-sulphur compounds and sulphur in a second apparatus (fig. 1), which "would probably be preferable as a rule, because a more concentrated solution of alkali polysulphides is obtained."

Controlling the Flow of Gas in Purifiers.

Beard, G. F. H., Scott, J. W., and R. & J. Dempster, Limited, of Manchester.

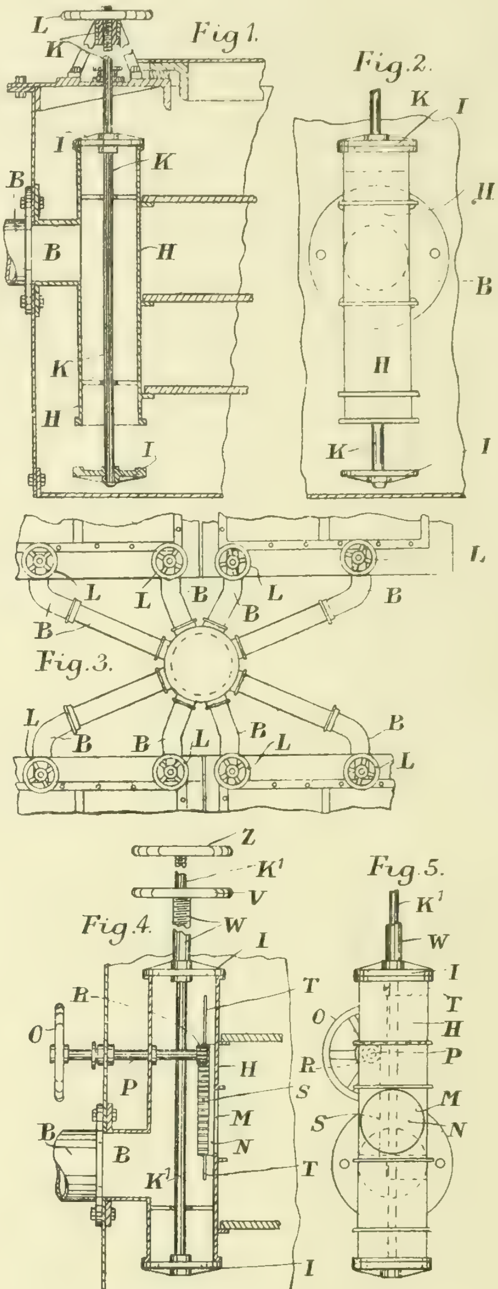
No. 844; Jan. 19, 1915.

In order to control the flow of gas in purifiers, so that the cycle of operations for the whole system is not interfered with for the time being, the patentees propose to provide each box of the purifier system (or as many boxes as desirable) with internal controlling devices, in the form of valvular connections, between the fluid apertures of each box and the interior of them.

Fig. 1 is a sectional elevation of a portion of a purifier according to the invention, and fig. 2 is a view at right angles (with certain portions omitted). Fig. 3, on a larger scale, is a plan of a portion of a purifier system, with an ordinary centre valve and its connections shown—some portion relating to the present improvements being indicated.

Each gas inlet and outlet aperture for the purifier is in communication with a casing or lute H, which can be opened at the top and closed at the bottom, or *vice versâ*, by means of valves I attached to a spindle K, under the control of an external handwheel. Thus, if the aperture B in fig. 1 represents the gas inlet for the time being, and the lower valve I be lowered as indicated, then if the upper valve I in the corresponding lute at the outlet of the purifier be opened when its lower one is closed, the gas will pass from the inlet and flow through the purifier from below upwards—termed by the patentees "a diagonal tendency of flow." By reversing the arrangement in both lutes, the gas will similarly pass from the inlet and flow through the purifier box from above downwards, or with a diagonal tendency reversed in direction or manner. This enables the gas, on first entering a box, to be brought into contact with purifying material which is least fouled; the direction of flow of the gas through the material being under control in the manner described.

But the general direction of flow of gas through the system will not be interfered with—that is to say, with reference to fig. 1, although the gas may continue to enter by way of the inlet B, its direction of flow may be from the lower end of the casing H, and upwards as it passes across the purifier; or the direction may be reversed, so that the gas may emerge from the upper end of the casing and then pass downward in its travel across the box, according to the manipulation of the valves I—the pipe B remaining the inlet for the gas, as already stated.



Beard and Scott's (R. & J. Dempster) Purifier Valve Control.

With reference to figs. 4 and 5, the lute H, forming one of a pair in a box, as in fig. 1, is shown not only capable of being opened at the top or bottom, but also can be opened at some position between. For the latter purpose a port M is shown in the casing, which can be closed by a slide valve N, capable of operation by the handwheel O, through the spindle P, pinion R, and rack S—the latter projecting from, and attached to the back of, the valve N. A feather T, projecting from the wall of the casing H, engages a groove in the rack S for guiding it. The upper valve I is under the control of the handwheel V through a threaded hollow spindle or sleeve W; while the lower valve I is independently under the control of the handwheel Z through the threaded spindle K^1.

Assuming the gas connection B in fig. 4 to represent the gas inlet for the time being, then if the outer port M in the casing be opened, and the upper valve I in the corresponding casing at the gas outlet of the box also be opened, the gas will enter the box for purifying purposes at the central zone, and flow upwards through the box in order to pass out at the outlet. But if the lower valve in the corresponding casing at the gas outlet be opened, instead of the upper one, the gas will again enter the box at the central zone, but will flow downwards in order to escape at the said outlet. If both valves be opened at the corresponding casing named as the gas outlet, and the aperture M at the gas inlet B be opened as before, then the gas will again enter at the central zone named; but part of the gas will pass upwards and part pass downwards before escaping at the outlet of the box.

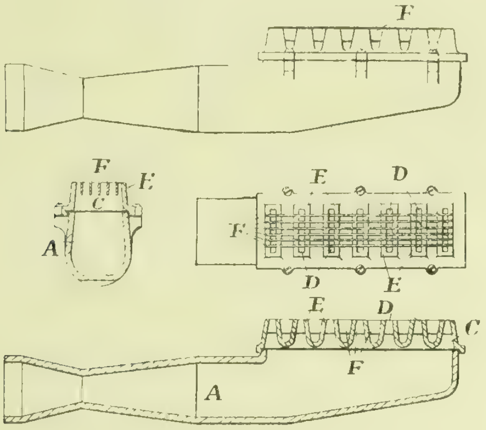
In all the methods described, the cycle of operations for the whole system is not at all interfered with.

Bunsen and Air Blast Burners.

Davis, H. N., and Twigg, W. R., of Luton.

No. 20,538; Oct. 5, 1914.

The object of this invention is to warm the secondary air before taking part in combustion, "so as to assist more effectively in the atomization of the gases." The burner is formed of a number of passages having independent walls; the passages being subdivided into orifices by plates which bridge channels or gaps between the passages, so as to form air heating chambers between the passage walls and the plates in which the secondary air becomes warmed.



Davis and Twigg's Heating Burner.

The illustration shows a side view of the burner, a plan, and cross and longitudinal sections.

The mixing chamber A is provided with an open end upon which is fitted a casting C, having a series of passages D through which the gases travel from the mixing chamber to the point of combustion. Each passage is formed with independent walls, so that secondary air can circulate around them—the passages forming a series of burners with air channels between them. The passages are sub-divided into still smaller burners by partitions F, secured in slots cut in the passage walls transversely of the rectangular passages; and they are so arranged as to bridge the channels or gaps between the walls of the passages and allow air to pass beneath them to the intervening spaces between the plates.

When the burner is in use, the walls E and transverse plates F become heated, with the result that secondary air in contact with the walls passes to the flames of the burner in a preheated or semi-preheated condition—giving, it is said, "better heating results than when no warming of the secondary air takes place."

Gas-Generating Apparatus.

Carpenter, H. A., of Sewickley, and Riter-Conley Manufacturing Company, of Leetsdale, Allegheny County, U.S.A.

No. 5268; April 7, 1915.

A serious difficulty in the operation of coal-gas generating apparatus, the patentees point out, is the tendency of solids carried forward by the gas, or which form therein by condensation, to deposit on the walls of the off-take passage, and so clog and obstruct it as to greatly retard the operation unless the passages are frequently cleaned. In apparatus of prior design, the gas is conducted from the retort to the standpipe through a connecting passage "of appreciable length, which affords ready lodgment for the obstructing solids."

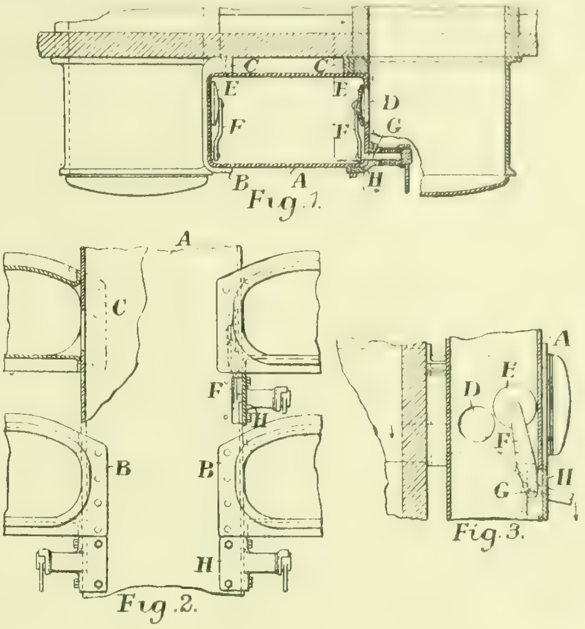
The primary object of the invention is to so construct and assemble the retorts or their mouthpieces and the standpipe as to eliminate a long connecting conduit by arranging the parts in abutting relation. The extent of the communicating opening is still further reduced by eliminating one of the abutting walls, so that the abutting portions of the closely adjacent parts are separated only by a single wall, through which the communicating port is formed.

In the present adaptation the adjacent side of the retort mouthpiece is open, and is adapted to fit against, and be closed by, an upright wall of the stand-pipe—the latter being provided with the port through which communication is maintained. Thus, while an efficient gas-passage is provided, a conduit or passageway of appreciable length is avoided. In forms of apparatus in which a standpipe is common to two upright rows of retorts, the pipe is simply fitted between the adjacent sides of the rows, closing the open faces of the latter, and providing a direct ported outlet therefor without the intervention of connecting conduits. A further purpose is to provide valve means of improved construction for controlling communication between the retorts and standpipe.

Fig. 1 is a sectional plan of a portion of a gas-bench equipped with the invention; the left-hand retort being shown in top plan, and the right-hand one in sectional plan. Fig. 2 is a view, partly in front elevation and partly in section, of retorts and a portion of the length of a stand-pipe. Fig. 3 is a vertical longitudinal section of a portion of a stand-pipe.

The retorts are set in a bench in the usual manner; and constituting an extension or continuation of each retort is a mouthpiece, the open outer end of which is closed by a door in the usual manner. The opposite side walls of the mouthpiece are equally spaced from the longitudinal centre of it; there being no lateral neck-like offset for connecting with the standpipe, such as is usually provided.

In order to eliminate the passage "of appreciable length" usually interposed between the retort or mouthpiece and the standpipe A, an upright wall of the latter is caused to abut one side of the mouthpiece. To minimize as far as possible the thickness of material between the mouthpiece and standpipe, an abutting wall of one of the parts is eliminated, so that they are separated only by the thickness of the wall of the other part. In the present adaptation, this is accomplished by forming the abutting face of the mouthpiece open, with the standpipe fitting and closing it. A structurally desirable arrangement is to form the outer end of the mouthpiece with a flange B and its inner end with a flange C, with the space between the flanges of just sufficient width to receive the standpipe and with the flanges secured to the latter—thereby firmly uniting the parts. Also, the top and bottom of the mouthpiece may be flanged for securing to the standpipe as shown.



Carpenter's (Riter-Conley Company) Retort Mouthpiece Apparatus.

When two tiers of retorts are connected to the same standpipe, the latter is simply fitted between them, as shown, eliminating the "objectionable lateral conduits" by providing direct connection between the standpipe and each retort through a port D formed in the standpipe wall.

When communication between the retort and the standpipe is valve-controlled, the valve E for each port D is of disc form and slidable on the inner surface of the standpipe; the surface providing an efficient seat, and the sliding of the valve and its pressure against the seat maintaining a gas-tight fit. Pressure of the valve toward its seat is afforded by the valve-carrying spring arm F, which is secured to the inner end of a shaft G extending through the wall of the standpipe beneath the retort and parallel with the axis of the port D. The shaft is rotatable in a housing secured to the standpipe, with a spring confined in the housing behind the handle-carrying head of the shaft for exerting pressure in a direction to hold the valve tightly on its seat. Thus the spring and the spring arm co-operate in maintaining the seat-cleaning and gas sealing functions of the valve.

The angular bracket-like portion H of the housing serves to close the slot or passage in a corner of the standpipe through which the valve E and its supporting and operating arm F are entered and removed without detaching them from the housing.

Manufacturing Sulphate of Ammonia and Purifying Coal Gas.

Mackenzie, J., of Middlesbrough.

No. 10,059; April 23, 1915.

This invention relates to the manufacture of sulphate of ammonia direct from the sulphur and ammonia compounds contained in gases generated by the dry distillation of coal; the process also serving simultaneously for the purification of such gases.

It is well known, the patentee points out, that coal gas contains sufficient sulphur to combine with the ammonia compounds also contained therein to form sulphate of ammonia; and several methods have already been proposed for effecting this combination—such methods being based mainly upon the principle of passing the gas, freed from tar, over heated oxide of iron, the oxygen of which reacts with the sulphur, contained in the gas as sulphuretted hydrogen, or other sulphur compounds, and produces sulphurous anhydride, which combines with the ammonia in the gas. It has also been proposed to employ nitrates for washing-out ammonia from coal gas; and in a process for desulphurizing gas obtained by the distillation of shale or mineral oil, it has also been proposed to utilize oxides of nitrogen for freeing or oxidizing the sulphur in sulphuretted hydrogen formed by hydrogen from an outside source combining with the sulphur in the gas—the freed or oxidized sulphur then combining with the ammonia in the gas to form ammonium sulphate, which is then removed. It has further been proposed in a process for the recovery or utilization from coal gas of ammonia in the form of ammonium nitrate or nitrite to bring the gas (before or after purification) into contact with uncombined nitrogen oxides or oxyacids obtained by combustion with nitrogen and oxygen of gas which has already been freed from ammonia.

The present invention has for its object to effect an improvement upon these methods by subjecting the gases in a moist atmosphere to the action of a compound of nitrogen obtained (for example) from sodium nitrate or by the fixation of atmospheric nitrogen; the medium oxidizing the sulphur compounds in the gases to form sulphur trioxide, which, with the moisture, forms sulphuric acid. This at once attacks the ammonia in the gases and forms sulphate of ammonia.

The patentee passes the gas freed from tar containing the sulphur and ammonia compounds, together with a suitable quantity of nitrous acid or its equivalent in a moist atmosphere at about 200° Fahr., into a vessel in which all the sulphur compounds are oxidized as described and sulphate of ammonia is formed. If sodium nitrate be used as the source of the nitrogen compound, it is mixed with sulphuric acid and the nitric oxide driven off by steam. The sulphuric acid decomposes the sodium nitrate and the steam denitrates the mixture, and the moisture referred to above is supplied by this means. Any excess of the nitrogen compound can be absorbed at the termination of the process in sulphuric acid of (say) 70 to 80 per cent. strength, after which it is said to be of advantage to pass the gas through lime boxes or to wash it with sprays of milk of lime so as to remove not only all traces of nitrogen compounds, but also the carbonic acid present. The nitrous acid can then be expelled from the sulphuric acid by denitration, and again used in the process.

"As all the sulphur compounds are oxidized in the course of the process, the gas which previously contained them, and from which they have been eliminated, is simultaneously purified."

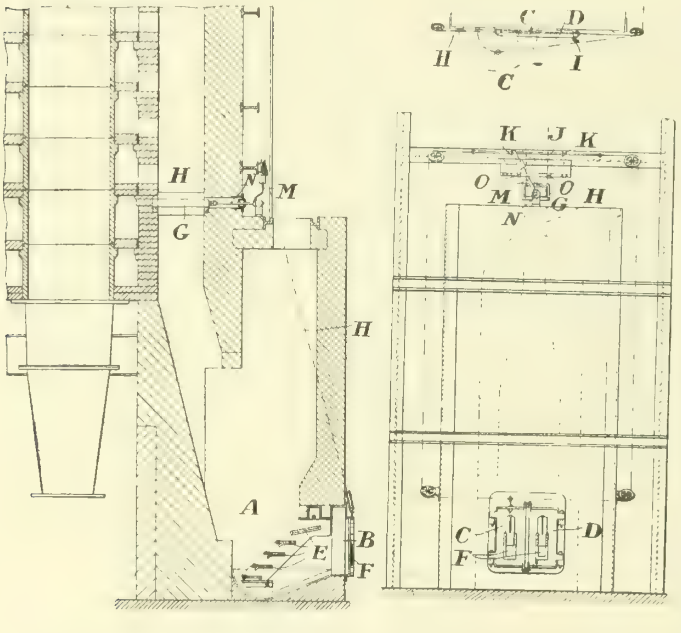
Gas-Producers.

Glover, Samuel, of St. Helens, and West, John, of Southport.

No. 21,517; Oct. 26, 1914.

This invention has for it object to provide "in a simple and effective manner" for the regulation of the production of producer gas, so that, notwithstanding the opening of the producer furnace doors for clinkering the furnace, the rate of gas production is maintained uniform, "whereby economy of fuel and better carbonizing results are obtained, and excessive formation of clinker prevented—resulting in greater ease of manipulation."

The arrangement comprises the combination with a producer furnace having doors by which access is obtained to the furnace grate for clinkering purposes of means whereby the movement of the doors is transmitted to dampers for regulating the area of outflow from the producer, so that when the doors are opened the outflow area is correspondingly restricted so as to prevent any increased rate of flow of air through the furnace.



Glover and West's Air-Regulating Arrangement for Producer Furnaces.

A sectional end elevation and a front elevation are shown of a portion of a retort-setting with a gas-producer having the invention applied to it.

The producer A has a doorway B fitted with doors C D through which access to the furnace grate E is obtainable. Primary air inlets to the furnace are provided in the form of adjustable slide-controlled apertures F in the doors. These inlets (of considerably smaller area than the furnace doors) allow of the passage through the furnace of the requisite amount of atmospheric air having regard to the chimney draught and the quantity and quality of gas required. To ensure this, the furnace door is connected with the damper G, provided in the gas outlet passage H from the producer furnace, so that when the door is opened there is a corresponding closing movement given to the damper, and the rate of flow past the damper "maintained practically constant under all conditions." When the door is closed (as shown), the damper is opened to its maximum position.

One convenient means for interconnecting the door and damper comprises a chain I secured to the door by a bolt, and attached to the ends of a rod J having stops K on it for engaging the bifurcated end of the weighted arm M upon the damper spindle N. Adjustable stops O upon a fixed bracket limit the range of movement of the arm M.

MISCELLANEOUS NEWS.

WANDSWORTH, WIMBLEDON, AND EPSOM DISTRICT GAS COMPANY.

The Half-Yearly General Meeting of the Company was held last Tuesday, at the Westminster Palace Hotel, Victoria Street, S.W.—Mr. H. E. Jones in the chair.

The Secretary (Mr. Charles W. Braine) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

Under War Conditions.

The Chairman said it became his pleasant duty, if anything could be pleasant in this war time, to address the proprietors upon the accounts; and to make what report he could of their stewardship of the Company for the past six months. They met again under the dreadful cloud of war—sad, troublesome, ever-pressing, and ever impeding their operations, but giving them, on the other hand, some consolation in the opportunities it presented for making efforts to assist the powers—the War Office especially—in such things as explosives. The Company had given them men to the tune of 30 per cent. of the whole of their staff. Some 350 men had gone out from the Company's works. They had given fuel and facilities to the poorer people of their district, who had repaid them very much by flocking to them for gas during the last six months, frightened, he supposed they were, by the appalling rate at which coal threatened to, and did, rise at one time.

INCREASED PRICE OF GAS AND DIMINISHED DIVIDEND.

The accounts, looking at the circumstances, he thought were very satisfactory. The profit did not quite equal the dividend; but this he would deal with later. As the proprietors were aware, it became necessary, to the deep and bitter regret of the Directors, to raise the price of gas. Raising the price of gas always throttled business. This had ever been the view of the Board. Fourpence per 1000 cubic feet (which was the amount by which they had increased the price) was the least that any Company had put up the charge for gas in London or the neighbourhood. It had been advanced 4d. by the Commercial Gas Company, 6d. by the Gas Light and Coke Company, and 8d. by the South Metropolitan Company, who were their nearest neighbours. But although their own Company did not put up the price much in amount, it was much when they had regard to the very low figures at which they were supplying their district, beginning with, in the largest part, 1s. 9d. to the ordinary consumers. It was a great grief to the Board to have to raise the price at all; but at one time the complexion of things looked very dark. For a time they could not get coal at all. When they could, what they got came with heavy expenses upon them; and there was every probability, as far as they could see, that these expenses were going to accumulate. So it came about that the Directors were able to give the proprietors, in proportion to the increase in the price of gas, only a diminished dividend—diminished by ½ per cent. on the bulk of the stock, because 4d. per 1000 cubic feet was the exact equivalent of four half-crowns per cent., which, by their Act of Parliament, was the amount by which they had to lower the dividend. It so happened, in connection with the Mitcham proprietors, that, as the Directors put the price of gas down last year, and for three months in the corresponding half year they did not get the extra dividend, they did not suffer by comparison quite so much as the Wandsworth proprietors—the reduction of dividend to the Mitcham proprietors being only 7s. 6d. per cent., as against 10s. But for the December half year, they would lose the full 10s. per cent.

RECENT COAL HISTORY.

The question of coal had been a very pressing and troublesome one, and a cause of great anxiety to both officers and Directors. A general problem of late had been the diminished quantity of coal which they could get. Strange to say, after the contracts had been made they were found to be incapable of fulfilment by the collieries; and yet they could buy coal from some of the collieries at higher prices, by some double-shuffle which he confessed he did not understand—at any rate, it did not seem quite straightforward to him. This led the Directors to take joint action with the Directors of the larger Gas Companies. As representing the Gas Companies' Protection Association, he (the Chairman) had to take a rather strong personal part in this matter. They had to interview the Board of Trade repeatedly; and ultimately they had a conference with something like half the members of the House of Commons, who assembled in one of the large Committee rooms to hear what the gas companies had to say about this matter. And they were rather surprised by the information that was then laid before them. He (the Chairman) hoped the proprietors had read the report of the Committee who were appointed to deal with the allegations of the different parties who are complaining—the gas companies, the water authorities, the municipal suppliers of gas and electricity, and others. The report was a very instructive one; and, he ventured to say, it did not redound particularly to the patriotism or the independence of those who were connected with the supply of coal in the North. It was not for him to say too much; but he thought they had nothing much in the way of respect to offer to those who would attempt, in a national crisis like this through which the country was passing, to make a profit out of the extremity of the nation. At any rate, the gas company representatives explained to the members of the House of Commons how they had gradually increased to an enormous extent the use of gas by the working classes, and that they had now a very much larger number of working class consumers than they had of the superior class; and it was a little curious to see the effect of this information upon the average member of the House of Commons. These working class consumers were all voters; and, as the proprietors knew, they were people who did not submit to much injury without shouting loudly. The consequence was that there appeared a chance, if something was not done in respect of coal, of there being a row in the constituencies. Gas companies had, through the supply of gas by means of prepayment meters, become very largely democratic institutions. The companies depended now for their revenue very much more than they did twenty years ago upon the large number of people who were called the working classes, though he doubted whether they worked any harder than he did. This resulted in the report from the Committee distinctly recognizing that the practices in the North were not to be commended, and that there should be at any rate a limitation put upon the way in which coal was leaving the country, and in directions which might possibly benefit the country's enemies. Restriction was therefore put upon the export of coal; and this at once produced an enormous relief to the British users of coal for all public service purposes. At the same time, when the Company came to make their contracts for the coming year, they had to pay a price 3s. per ton in advance of what they paid before. Therefore he was bound to warn the proprietors that the accounts before them showed a much lighter expenditure for coal than the accounts would do for the next twelve months, because in the present ones they had been using the arrears due on the old contracts which they had at a lower rate.

THE SALE OF GAS.

The sale of gas was reported as having shown a decrease of 0·8 per cent. in the past half year. This was rather increased during a few weeks in the present half year. But he was glad to say there were now signs of improvement; and he hoped they would not have a reduction in the half year in gas income.

CAPITAL EXPENDITURE ON METERS, STOVES, AND ANOTHER SHIP.

The capital expenditure had been comparatively small. He was in the habit of pointing out that the expenditure on capital should not be in the same ratio as the increase in the sale of gas, if they wished to improve their financial position. He regretted to say this time he was beaten by circumstances. The expenditure in the half year was chiefly on meters and stoves, which the Company supplied in large quantities as compared with previous experience. The public were evidently turning from the coal merchant to the gas company. They noticed that the price of gas was only increased by a few pence, whereas their coal bills had mounted up; and so they came to the company for stoves in order to save their coal bill. To have refused these consumers would have been a foolish thing indeed. Therefore, though money was dear, the Directors found it prudent to spend in the half year £8500 upon meters and stoves. They had also to increase their fleet of waggons and motors, for improving the distribution of coke and other goods, and in order to improve the stocks of coal at the various works, which stocks had fallen through the delay to the ships the Company already possessed owing to Admiralty precautions. On these additional waggons and motors, they spent £2963. The Board also bought another steamer, which increased the capital account by £12,100. With this third steamer, they were now in a position to be practically independent of the various incidents and delays due to war regulations. All these three lines of purchase some people would say were liable to depreciation and waste. So they were; but the Board did not let them waste. He had a letter from one proprietor—who pointed out that these were wasting assets. They were not. The Board kept their ships well insured, and well written down for depreciation. They did the same with meters and stoves, and waggons and motors. On capital account during the half year, they had spent £23,547, which was practically 2½ per cent. increase on the standing capital; and more than half of the increase was due to the Company possessing their own ships, which was a good form of property for them. The larger companies who did not own ships were now rapidly procuring them, because they found that to rely upon outside freights at a time like this was perfectly ruinous. The proprietors would see that this was good policy when he told them that this Company were actually asked to pay a freightage of 13s. per ton for an extra cargo of coal they needed; but the party concerned rebated it afterwards under strong protest. The average cost with their own ships for the same duty was nearer 4s. per ton, and less than that in ordinary times; so the proprietors would see the economy of the Company being shipowners.

SHORTAGE OF PROFIT DUE TO EXCEPTIONAL CHARGES.

The result of the half-year's working was that the profit balance of £30,120 did not meet the dividend by £5050. But if the proprietors looked at the last lines on the expenditure side of the revenue account, they would see that a sum nearly equal to this amount had been paid away in unusual charges. There was food allowance to their workmen due to the war, £2128; there were the contributions to the dependants of employees who had joined the colours and were on active service, £2811; and there were the discounts, amounting to £50, to those institutions which had taken in Belgian refugees. Therefore, but for these exceptional charges, they would have about earned the balance of £5050 required to pay the dividend. As it was, they had to go to their accumulations for the sum.

THE DEPRECIATION OF INVESTMENTS.

He was reminded by a proprietor who had written on the subject, and by the report of the Auditors, that the securities in which the Directors were unwise enough to invest the reserve fund had gone down £7000 or £8000. To have kept the money in the business of the Company would have been a wiser thing to have done, because it would not have depreciated. This depreciation had not arisen alone in the past half year; and there was no reason why the Board should ask the proprietors to forego a quarter part of their dividend on this occasion, because the depreciation had been gradually accumulating for some six or seven years. The most they could have done with it would have been to have stated in the accounts that the figures represented cost price, and to add that the securities would not sell for so much to-day. But the Directors were certainly not going to sell them to-day. In the case of a sliding-scale company with power to raise the price of gas on emergencies, there was no occasion to sell the securities in which their reserves were invested. Nothing short of a serious accident would cause the Directors to think of selling any of these stocks. Whenever they came back to their original value, or anything like it, they would have to write them up again. At the meeting of the Commercial Gas Company a few days ago (of which Company he, Mr. Jones, was Deputy-Chairman), Mr. George Ennis, who was for some time an Accountant of a large company, said that to write-down the reserve fund to the present depreciated value of investments would be a great mistake; and the Chairman (Mr. W. G. Bradshaw) said he had only alluded to the matter because the Official Auditor of the Board of Trade desired it. Their own Company were not under an Auditor of the Board of Trade; but they were under strong Auditors. Their leading Auditor (Mr. Burton) was well known to be a very exact gentleman. The Auditors mentioned the matter of the depreciation of value; but all they meant to do was not to charge the depreciation to the account of dividend, but to write off the amount in the statement of accounts. When the proprietors desired this, the Directors would do it; but he (the Chairman) strongly recommended them not to desire it. Regarding the dividend, he ought to have mentioned that the full upkeep of the undertaking had been well maintained. They had spent upon the maintenance of the works within a fraction of 4d. per 1000 cubic feet; and they had spent on distribution, repairs, and renewals a sum of close upon 5d. per 1000 cubic feet. This constituted a very ample, and more than ample, allowance, to maintain the concern in the best possible condition, both financially and practically in operation. They had also written off part of the suspense account, which stood at over £12,000 in last year's account. This was now reduced to £9920; and the Board hoped the next three half years to extinguish the amount altogether. He had great pleasure in asking the proprietors to accept and pass the report and accounts.

The DEPUTY-CHAIRMAN (Mr. R. Garraway Rice) seconded the motion.

Alderman T. R. PORTER said he was in full accord with the Directors and supported the report. From the formation of gas companies, there had never been such a critical period as the present; and he thought it was well this should be brought home to people. In regard to the consumption of gas, he took it the only loss was in consequence of the lighting being stunted by the authorities. [The CHAIRMAN: Largely.] As to the 4s. for the carriage of coal, against 13s., was the 4s. the ordinary freightage? [The CHAIRMAN: By our own ships.] This showed the want of patriotism that existed among the shipowners. Concerning the investment in Consols, he believed it had been the established security in which reserves were placed. [The CHAIRMAN: By law.] And by law they had unfortunately been brought down very low. But the Company were only placed in a similar position to other companies and individuals. They were all suffering from the same thing. Under the circumstances of the times, the Directors had got out a splendid report; but the proprietors had to remember that the position might be worse twelve months hence.

The motion was unanimously carried.

THE DIVIDENDS.

The CHAIRMAN moved the next resolution, to the effect that dividends be declared at the statutory rates per annum, less income-tax: On the "A" stock, £7 17s. 6d., on the "B" stock £6 7s. 6d., on the "C" stock £5 10s. 3d., on the Wimbledon stock £5 15s., on the Epsom stock £6 7s. 6d., and on the new ordinary stock £5 10s. 3d. He explained that, of the Wandsworth "A" stock, there only existed £15,000. He thought the proprietors were to be congratulated upon getting dividends of these amounts.

The DEPUTY-CHAIRMAN seconded the motion, which was unanimously carried.

HIGH EXPLOSIVES AND MUNITIONS WORK.

The CHAIRMAN said he did not think the proprietors would like to part without recognizing the efforts of their officers—from Mr. Braine, their oldest officer, down to the smallest boy. All were doing their best in these troublous times. Both Mr. Carr and Mr. Braine were strenuous officers; and they were backed-up by very energetic and valuable officials at all their three works, and by equally valuable officers who took care of the whole of the distribution. These were backed-up by foremen and superintendents, and these again by cheerful, willing, profit-sharing workers, who largely represented those who had gone away to the war, and with whose dependants the Directors were now dealing. Some of their men, to the great regret of all, had fallen in the country's cause. Mr. Carr held a distinguished position; having been selected to help Lord Moulton's High Explosives Committee in working, through twelve counties in the South of England, to secure the greatest appropriation of toluol from the gas made by the different gas undertakings. It had been found that toluol was largely used by their enemies, who had been conservative of this particular explosive, and had been storing it up for some years. Mr. Carr was one of those appointed to meet the emergency—not only in connection with his own works, but at others—by inspecting, exhorting, and enabling the managers to be up to date in absorbing this valuable explosive from the gas. He (the Chairman) thought it right to report the compliment their Engineer had received, as he felt that the proprietors would be gratified to know it. [Hear, hear.] One of his assistants (Mr. E. J. Fottrell), who looked after the distribution of gas, was employed by the Munitions Committee to promote the production of shells, fuses, and other munitions of war. He was local agent for the Munitions Committee, and was doing yeoman service. So it would be seen that the Company were, through their officers and men, doing a great deal to actively help in the war. They were doing the same through machinery, and, in fact, were assisting in every possible way. They were also giving the Munitions Committee the use of a large store and a wharf and dock at Wandsworth. He knew that in this respect the Board had only anticipated the wishes of the proprietors. The Company were not making a penny profit out of it.

Alderman PORTER, in seconding the motion, said it was a great pleasure to the proprietors to know what was being done by the Company to aid the country in these days of emergency. The Chairman, he believed, was a member of the Munitions Committee; and he knew that all, from Mr. Carr and Mr. Braine downwards, were working well.

The motion was cordially passed.

Mr. BRAINE and Mr. CARR acknowledged the compliments paid to them, their assistants, and the employees generally.

THANKS FOR THE BOARD.

Mr. R. L. ANDREWS moved a vote of thanks to the Chairman and Directors. He remarked that it was a great relief to the proprietors to know that gas companies were paying their dividends while so many other concerns were not doing so. He inquired how the proprietors responded to the recent issue of capital. While thanking the Chairman and Directors for what they had done during the past six months, he asked the proprietors to extend to them their sympathy for what they had got to do during the next twelve or eighteen months.

Mr. SAMSON seconded the motion, which was heartily agreed to.

THE RECENT ISSUE OF CAPITAL.

The CHAIRMAN, in replying on behalf of his colleagues and himself, referred to the recent issue of capital. He said the appeal they made was for £46,500, which was not a large sum, seeing that they owed their bankers a great deal more. The result of the sale was that they only placed £17,598; leaving £8841 of ordinary stock and £17,972 of debentures still to dispose of. They could have placed the whole amount, but did not think it wise to put the undertaking under a debenture obligation at a higher rate of interest than was offered. It had occurred to the Directors that they might, on the next occasion, offer the stock among the proprietors, instead of selling it by auction. It was, however, very difficult to deal with these odd amounts; and so they would bring out more stock if the Treasury would allow them to do so, in order to make a round sum of it. He was certain, if the Directors circularized the proprietors, they would be willing to make a good response by taking up a further amount of the stocks.

CROYDON GAS COMPANY.

The Half-Yearly General Meeting of the Company was held last Friday, at the Company's Office, Katharine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. W. Topley) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

STABILITY AND SALES OF GAS.

The CHAIRMAN, in moving the adoption of the report and accounts, said the conditions affecting the conduct of the business during the half year had in general not differed greatly from those which he had to describe to the proprietors in February last. Perhaps, however, the main points worthy of notice were a lessened cause for anxiety as to the supply of coal, the indications furnished by the accounts of their internal resources of financial stability, and the way in which the undertaking, in common with those of most prudently managed gas companies, obtained some automatic compensation for any temporary check in its progress, in the reduction of expenditure it was enabled to secure. The proprietors would have seen that the sales of gas showed a slight increase; and this, under the circumstances, was, he thought, a matter for satisfaction. Certainly in this respect they stood in a not unfavourable situation when compared with those of their neighbours who, like themselves, had had little or no output of gas for special war purposes. He was not sure that a largely increased sale of gas at the present time, if due to special consumption for military purposes, was to be desired. While a large increase in a given half year was a source of increased profit, it involved a heavy strain on the productive side of the undertaking at a time when the steps thereby necessitated were both costly and difficult. Moreover, such an increase was in its nature temporary, and an artificial inflation of output of this kind was likely to be followed by a time when it would be difficult, if not impossible, to maintain the sales of the preceding year, while the expenses incurred in meeting the temporary increase remained a charge upon the undertaking. If the proprietors referred to the statement in the accounts of the gas sold for public lighting, it would be seen that it amounted to less than one-half that of a year ago—a loss of output representing 13 million cubic feet in the half year. This was, of course, due to the restricted lighting enforced by official requirements. A loss, probably little if any less, was also due to diminished shop lighting. If they allowed for this, they saw that the ordinary growth of the business had —notwithstanding the general tendency to study economy in private life—been practically maintained; and, when return was made to more normal conditions, they might, he thought, reasonably expect to revert to the steady rate of increase they had in the past been accustomed to.

COMPENSATIONS.

The increase in the number of consumers was 435, in stoves on hire 1435, and fittings 1287. This was satisfactory progress, although not quite at the same rate as the Company had experienced in normal years, and were justified in assuming they would have experienced this year but for the special conditions prevailing. The addition of a new consumer, or the hiring of an additional stove, involved a good deal of outlay, which, under their method of dealing with expenditure, was charged at once to revenue – thus leaving the sale of gas in the future a source of increased profit freed from the charges incurred when the account was opened. When, therefore, as in this half year, the rate of growth was temporarily slackened, an immediate saving, compared with previous half years, could be effected; and this would be seen in most of the items under the head of distribution. In saying this, he did not wish in any way to belittle the efforts which their officials in this department, in common with others, had made, and made successfully, to effect the economies which were incumbent upon the Company, as upon all the nation, during the time through which they were now passing.

COAL AND QUALITY.

On the manufacturing side, it would be seen that gas had cost about the same, notwithstanding the increased price of coal. In fact, coal, oil, &c., after deducting the returns from residuals, was substantially lower than a year ago. The price of coal was not the only unfavourable circumstance the Engineer and his staff had had to contend with. The difficulties as to supplies (at one time a matter of the gravest anxiety) had necessitated working under conditions dictated less by considerations of economy than by availability of raw material. They had not been able to scrutinize as closely as they could wish to do the quality of the coal they had been able to secure; and considerable expense had been incurred in working from old stocks of coal and in storing coal in unusual positions. That, under these conditions, such good working results had been obtained, was a circumstance on which they should heartily congratulate their Engineer and those who had assisted him.

POSITION OF RESIDUALS—ADVANTAGES AND DISADVANTAGES.

The receipts from residuals were, in the main, satisfactory. In regard to coke, they had benefited by the enhanced prices of fuel generally; and sulphate of ammonia was, both as to working results and as to the price obtained, very satisfactory. The average price of their sales was £12 12s. 7d. per ton, against £11 6s. 10d. last year. This was due chiefly to the elimination of German competition—about the only benefit received on account of the war—in the export market; but sulphate of ammonia makers would do wisely not to forget that this elimination was in all probability a temporary one only. The proprietors would remember that little more than a year ago the falling value of sulphate of ammonia was a matter of very grave concern to manufacturers in this country. A method of manufacture by synthetic means direct from the nitrogen of the air had been discovered, and made (by Germany) commercially practicable, with the result that a production limited in extent only by the relation between the cost of manufacture—which was said to be low—and the price obtainable, was to be looked for in the near future. This menace to the price was now, fortunately for British makers, removed. But it was for the time only; and it was reasonable to assume that, with the return of the world to peace and to industrial ways, international competition between makers of sulphate would again become keen. In the future, as the Sulphate of Ammonia Association had been pressing upon the notice of manufacturers, quality would be a very important consideration in assisting in the disposal of the product; and in this direction they might, he thought, congratulate themselves on the fact that the Company had, for some time past, consistently conformed to the highest standard regarded as obtainable by manufacturers in this country. Tar had shown rather disappointing results. He had on a previous occasion explained the difficulties created by the war in disposing of one of its chief constituents, pitch. They had also been to a large extent deprived of the sale of tar for road-making, through Government action, due to the wish to recover the largest possible quantity of high explosives from the coal and its products. Such tar as they had sold had had to be specially treated—this resulting in increasing the cost to the buyers by about 50 per cent. They could not regret, much less complain of, this, so far as it assisted the nation in the successful conduct of the war; but the loss to the Company had been very great.

AT THE FRONT.

It would be seen from the report that more and more of their employees were leaving (in most cases, it was hoped, but temporarily) to serve their country as combatants; and now well over 200 were so engaged, afloat or ashore. Four, he regretted had given their lives; as to the others, the proprietors would, he was sure, join with him in an expression of hope for their welfare and safe return. [Hear, hear.]

CONSUMERS, EMPLOYEE CO-PARTNERS, AND STOCKHOLDERS.

The question of the price of gas was one which engaged the anxious consideration of the Directors in the early part of the year; and it was felt that, under the circumstances then existing, and in view of the grave difficulties in prospect, they could not with prudence avoid an increase. They, therefore, although with great reluctance, raised the price by 3d., as from Lady-day. The total increase, therefore, had been (with the previous penny increase) 4d.—an amount much less than that which many companies had found necessary. With the uncertainties as to the early future which still confronted all, the proprietors would understand that he could not say anything definite now as to their course of action. It would be unwise to reduce the price unless they saw a reasonable prospect of maintaining the reduction; and they had yet to bear the full incidence of the higher prices of coal. But he could assure the proprietors and consumers that, as soon as the Board considered it could be done with safety, they would have the greatest possible pleasure in announcing a reduction. The increase in price was felt by the co-partners, whose rate of bonus fell from 6 to 2½ per cent. The last increase in the price would also cost the consumers about £18,000 per annum; and the Directors felt it would be right that the "A," "B," and "C" stocks of the Company, which were subject to the sliding-scale, should share in the general loss; so they recommended, as would be seen, dividends at a rate less by ½ per cent. than those previously paid. This was relatively a much less reduction than in the case of the stocks of other companies whose price of gas had been advanced. He felt sure the proprietors of the "A," "B," and "C" stocks would, in common with the Directors, cheerfully bear their share of the general burden.

ISSUE OF NEW CAPITAL.

During the half year, it was found necessary to raise further capital; and the consent of the Treasury having been obtained, £25,000 "D" stock was issued by tender in March all at, or over, par. This result was one on which, under the then existing market conditions, they might regard as a testimony to their standing in the eyes of investors. The capital outlay necessitating this issue was chiefly the construction of the new gasholder tank, now completed, and the erection of the gasholder. Progress was still being made with the latter, although slowly, owing to the scarcity of labour, and to a partial diversion of the contractor's resources to meet Government demands. Though they would not have the holder available, as had been hoped, for the coming winter, the Directors thought they could count upon it being ready for use in the winter of 1916-17.

INCREASED STOCKS OF COAL AND OIL.

He was glad to say they had recently been able to largely increase their stocks of coal and, though to a lessened extent, of oil. But latterly they had been receiving greater quantities of oil; and their tanks were nearly full, so that they were less anxious on this head. At the same time, the Directors hoped that representations which had been made to the Government on behalf of the gas industry might assist in increasing the availability of tank-steamers for the shipment of oil fuel. But on the whole, they were relieved of much of the anxiety as to raw materials which weighed upon them six months ago.

RENEWALS.

There was one item in the accounts to which he should like to refer, in justice to their Engineer. It would be seen that the charge under the head of "Repairs, &c., of Plant" was larger than a year ago. This was not due to any excessive expenditure, though they had been faced with the necessity of greater outlay on the renewal of retorts than in the corresponding half of last year. The increases arose from the fact that they had charged to revenue considerable sums which could have been spread over several half years. To this extent, the profits of future half years had been relieved of a burden they would otherwise have borne; and they would reap the benefit of this in the future.

THE NET RESULT.

The net result, as shown by the accounts, was a profit which, though not quite sufficient to provide dividends at the old rates, enabled them to pay them at the rates now recommended, and to increase the carry-forward by £400.

DEATH OF THE SENIOR AUDITOR.

He had left to the last mention of the great loss the Company had sustained, in common with many others, by the death of their senior Auditor, Mr. J. C. Benwell, which the proprietors would, he was quite sure, deplore as deeply as did the Directors. He had been a familiar figure at their meetings for many years—his connection with the Company as Auditor having lasted over 37 years (from 1878, when he succeeded his then partner in the office). During the last few years, his health had been failing; and on several occasions he was assisted in the work of the audit by his partner, Mr. Sloman, who, at the request of their surviving Auditor (Mr. John Jones), had assisted in the audit of the current half-year's accounts. Mr. Sloman had intimated his willingness to succeed Mr. Benwell in the office; and while the election of Auditors was a matter entirely for the proprietors, and one on which he would not wish to influence them, he might say that Mr. Sloman was fully qualified for the position, and conversant with the accounts. His appointment as a colleague would, he (the Chairman) believed, be acceptable to the present Auditor.

The Deputy Chairman (Mr. Thomas Rigby), in seconding the motion, observed that he considered the report very encouraging.

Mr. Charles Webb said he noticed that the Directors had increased the price of gas by 4d. per 1000 cubic feet; and consequent upon this, there was a reduction of the dividend by ½ per cent. He should like for information to ask whether there was no margin which would allow them to raise the price of gas without reducing the dividend.

The Chairman replied that they could certainly have increased the price of gas without lowering the dividend. But the Directors thought—they were quite unanimous on the point—that the proprietors should subscribe something, seeing that the employee co-partners and the consumers would have to bear their part of the financial burden occasioned by the war. The Directors themselves were very large stockholders, so that they all took their share.

Mr. Webb remarked that the Company were therefore in a much better position than was shown by the accounts. The proprietors still had a margin; so that they were not in at all a bad way. Gas stocks kept a good investment. [Hear, hear.]

The Chairman said he ought to explain that the Company had never paid full dividends under their statutory powers. The Board preferred to sell gas at a favourable price rather than pay dividends up to the hilt. Being strongly in competition with electricity, their best policy was to sell gas as cheaply as possible.

The motion was unanimously carried.

The Dividends.

The Chairman said he should like to remark here, as the proprietors were aware, Sir Corbet Woodall generally proposed the next resolution. He (the Chairman) regretted to say that he had received a letter from him asking the proprietors to excuse his presence on this occasion. Sir Corbet was a particularly strenuous man; and he was not in the best of health. He was sure the proprietors would express their sympathy with him. [Hear, hear.]

Mr. William Cash, F.C.A., then moved the declaration of dividends at the following rates per annum: On the "A" stock, 14½ per cent.; on the "B" and "C" stocks, 11¼ per cent.; on the "D" stock, 5 per cent.; and on the "E" stock, 10 per cent.—all less income-tax. In the course of his remarks, he said the Chairman had dealt, in his usual clear and complete manner, with all the important features of the half year. The period had indeed been a time of considerable stress and difficulty for both the officers and the Directors. Their main requirement, coal, had given them a particularly anxious time. That the Company had come through so well was a matter for congratulation. The Chairman had explained the recommendation of the Board regarding the dividend. The consumers had to pay more for their gas, the employee co-partners' bonus had been reduced, and the stockholders were asked to share some part of the burden by taking ½ per cent. less. Nevertheless, the actual amount distributed on this occasion in dividend was slightly more than it was in the June half of 1914, because of the issues of stock in the interval. Having regard to this aspect of the matter, it was satisfactory that they had earned, and rather more, the full sum required, and were able to distribute more over the whole body of proprietors than they did in the corresponding half of 1914. He was sorry Sir Corbet Woodall was not present. The gas industry was greatly indebted to him for the valuable work that he had done in the matter of the supply of coal not only for this Company, but for all the other gas undertakings in the kingdom.

Mr. Percy H. Hall, J.P., seconded the motion, which was unanimously carried.

The Late and the New Auditor.

Mr. J. T. Maitland remarked that it was with very great sorrow that the proprietors had heard of the death of their late Auditor (Mr. J. C. Benwell). They all deeply regretted the loss. However, they had now to elect his successor; and it gave him pleasure to propose that Mr. Frederick S. Sloman, A.C.A., should be elected to the vacancy. The Chairman had said all that it was necessary to say regarding Mr. Sloman's qualifications for the office.

Dr. Critchley, in seconding, said that in Mr. Sloman they had a gentleman who had an intimate acquaintance with the accounts of the Company; and therefore the work would come to him with considerable ease. Before seconding the resolution, he had ascertained that Mr. Sloman was a man most suited to the appointment.

The motion was heartily agreed to.

Mr. Sloman, thanking the proprietors for the honour conferred upon him in appointing him an Auditor of the Company, promised that the audit should be an efficient one. For the kind words used with reference to his late partner, he thanked them; and, when he saw the members of Mr. Benwell's family, as he did occasionally, he would convey to them what he had heard that day.

Votes of Thanks to the Board.

Dr. Rodman said the proprietors had heard sufficient to assure them of the arduous duties that had fallen upon the Chairman and Directors during the past half year. In a time such as they had been through (he could speak from experience in a similar capacity in connection with another gas company), matters of very serious consideration had to come before the Board, and especially that of the purchase of coal. He was sure, under the circumstances, that they all felt, especially on this occasion, they owed a great deal to the Board. Had it not been for their assiduous attention, the stockholders would not have seen a balance-sheet anything like as satisfactory as the one submitted to them that day. He had therefore much pleasure in proposing a hearty vote of thanks to the Chairman and Directors.

Mr. Webb, in seconding, remarked that, when he came to the Croydon Gas Company's meetings, he always went away feeling as though he had had a tonic; it was all so refreshing. He thought they ought to be very gratified that they had a Board of Directors of such ability looking after their affairs at the present time. They had been having a more strenuous time than ever before, and he hoped would ever have again. The fact that there were comparatively few present out of the large number of proprietors (he believed there were something like 3000) was an evidence of satisfaction. However, those present tendered to the Board their best thanks. He was afraid (but he hoped not) that there were bad times in front of them all; but the Directors were cautiously watching the times for them.

The motion was unanimously adopted.

The Chairman, on behalf of his colleagues and himself, thanked the mover and seconder for their kind words, and the proprietors for the manner in which they had unanimously endorsed them. He said he must confess that, in the early part of the six months, they had an especially anxious time, because they were running short of coal; and they did not know what was before them. He was happy to say they had passed through this stage; and they were not now in any state of anxiety regarding the coal supply for next winter—at any rate, they felt pretty well assured on the point. They had in hand to-day a large stock which they hoped to supplement. Still there was anxiety regarding the future. The war was not going as favourably as they could have wished; and it was hoped that it would not be long before they saw improved conditions in this respect. But whatever the anxiety, whatever the conditions, the proprietors might rely upon the Directors giving their best attention to the business.

Officers, Staff, and Men.

The Chairman said he had now a pleasing duty to perform, and for the forty-seventh time. This was to propose a vote of thanks to the officers, staff, and workmen for their efficient services. Mr. Caddick as Engineer, Mr. Topley as Secretary and Accountant, Mr. Sandeman as Distributing Engineer and Sales Manager, Mr. Anderson as Assistant Secretary, Mr. Haines, and Mr. Stones, were all, in their different departments, doing their best in the interests of the Company, and producing the best results they possibly could. The workmen were also working under as happy conditions as could be expected during these times of stress. The Company had assisted their men, and especially those who had gone to fight for the country's cause in the war. The Company were looking after the dependants of the men, and seeing that they were not suffering in any way. They had been able to sufficiently fill the places of the absent workers, though some of the men at home had had to do more than they did previously. Still they had buckled to, and had shown a strong disposition to do their best in the interests of the Company. As to their Engineer, he had had a very anxious time, especially during the period when they were running short of coal. Now he was having an anxious time respecting the tar, and the Government requirements. The Government had (so to speak) commandeered all the tar; and it had to be used in such a way as to extract the toluol from the gas for the making of high explosives. This had been a loss to the Company, because they made a better price by selling the tar for road making than in selling it after the toluol and light oils had been taken out. Mr. Topley had had an anxious time because all these matters created extra correspondence; but he had faced it all in the proper spirit. The time had also been an anxious one for Mr. Sandeman, because of the curtailment of street and shop lighting owing to Government restrictions. This could not be helped; it was inevitable. And Mr. Sandeman was doing his best to raise the demand in all ways possible.

Mr. Samuel Spencer seconded the motion; and it was heartily passed.

Mr. A. Caddick, on behalf of those engaged at the Waddon works, sincerely thanked the Chairman for the kind words he had used, and the proprietors for so cordially ratifying them. His words were particularly encouraging, and especially so during the strenuous period through which they were now passing. It was a pleasure to him to be able to say that those who were connected with him at the works had risen to the occasion, had tried to do their level-best, and had shown a determination to overcome the many difficulties that had to be encountered. He felt that, during the winter which they would soon have to face, he could reckon upon all—staff and men alike—continuing the good services they had rendered for many years past. On this occasion, he should like to express his personal thanks to all those with whom he was associated for their able and loyal assistance during the troublesome times. The Chairman had referred to the fact that their coal stocks were considerably in excess of what they were this time last year; but apart from raw material, there were in the carrying on of a gas-works a good many difficulties in other directions which those unacquainted with the work could scarcely realize. They had to face these difficulties; and those working with him at Waddon would do their very best to carry through.

Mr. W. W. Topley thanked the Directors and proprietors, on behalf of those associated with him in the secretarial and accountancy work, for the kind recognition made of their efforts. He also thanked those who had assisted him, and had helped to lighten his task. They were all delighted that, under the trying circumstances, the position had come out so satisfactorily.

Mr. W. J. Sandeman, on behalf of the distribution and sales department, also acknowledged the vote. He was happy to say that, notwithstanding the difficulties with which they had had to contend during the half year, things had gone very smoothly, owing to the loyal co-operation on all hands.

The Founder and Chairmen of the Company.

There were three portraits hanging on one of the walls of the meeting-room; and, at the conclusion of the business proceedings, the Chairman called attention to them. He said they were of very great interest to the Board of Directors; and he thought they would be of interest to the proprietors. One was the portrait of Mr. Henry Overton, the original proprietor of the Croydon Gas-Works in 1846. In 1847, the undertaking was transferred to a Company; and the second photograph was of the first Chairman, Mr. W. S. Owens. He was Chairman from 1847 to 1855. They had not a succession of the photographs of the Chairmen; and the third one was of Mr. Edward Berney, who was Chairman from 1865 to 1887. Mr. Berney was therefore Chairman for 22 years. By the indulgence of the Directors and proprietors, he (Mr. Hussey) had exceeded Mr. Berney's tenure of office by one year; for he had been Chairman 23 years. He hoped he had not done yet. [Hear, hear.] There was one interesting thing he ought to say about the portrait of Mr. Henry Overton. It was given to the Company by their Assistant-Secretary (Mr. Edward Anderson) and his wife. Mr. Anderson, by a stroke of good luck, was able to win the affections, and finally became the husband, of Mr. Overton's granddaughter; and it was due to this that the Company had become possessed of such a nice portrait of the original owner of the Croydon Gas-Works.

PORTSEA ISLAND GASLIGHT COMPANY.

The Half-Yearly Meeting of the Company was held in the new offices, on Thursday last.

The Chairman (Mr. R. Edgcombe Hellyer), in moving the adoption of the report and accounts [*ante*, p. 358], remarked that no useful purpose would be served in comparing the details of the working results of the half year under war conditions, with the corresponding half year of 1914, when peace existed; but it was highly satisfactory to know that the quantity of gas sold during the first six months of last year had been maintained within 2·74 per cent. This was the more gratifying having regard to the fact that in 1914 the half year showed an unexampled increase over any similar period; being no less than 8·79 per cent. in excess of the first half of the year previous. The sales for the six months under consideration had been adversely affected by the continued restriction of outdoor lighting and early closing of licensed premises, and also by the temporary diminished pressure necessary owing to the great difficulty experienced in obtaining adequate supplies of coal and oil. The number of consumers had increased in the six months by 899 to 50,233, and the cooking and heating appliances on hire by 1739 to 36,104; and he was confident that, had the conditions been normal, last year's sales would have been surpassed. The Directors and the Engineer and General Manager (Mr. J. D. Ashworth), as well as the Secretary and the Company's general staff, had had a very hard and anxious period. There had been times when their short stocks of coal had occasioned grave concern. At the Flathouse works, on one occasion, the coal supply was reduced to less than three-quarters of a day's consumption, and on another to half-a-day's requirements; while for days together the oil at these works had been entirely exhausted. At the Hilsea works the position had been slightly better; but the aggregate stocks had been as low as four or five days' requirements only. In consequence of this, it was necessary to reduce the pressure of gas in the district; and the quality at times fell below the usual standard. But though complaints had been received from a number of consumers, the great majority realized the Company's difficulty, and the thanks of the Board were due to them for the consideration they extended to the management. While on this subject, he wished to put on record the fact that, throughout all their difficulties, the Board had received the utmost consideration from the Corporation; and although in the performance of their duties they had more than once complained of the quality of the gas supply, at all times they were prepared, by interviewing the Board, to listen to and consider the explanation which the Directors had to offer. In addition to this, at the invitation of the Directors, a Committee of the Corporation had visited the works and seen for themselves, not only the very small stocks in hand, but also the inferior quality of the coal delivered. He also wished to acknowledge the assistance they received from the Government Departments and the railway authorities, both in London and Portsmouth, all of whom, recognizing the important purposes for which gas was being used by the Naval and Military authorities in the district, fully appreciated the vital necessity of avoiding any interruption in the supply, and had at all times been ready to do everything in their power to help the Company in the matter of transport of raw materials. The full statutory dividend was recommended by the Directors, and £2000 had been transferred to the extraordinary renewals account. This result, he thought, was highly satisfactory; but he wished to point out to the shareholders that there was a balance of £8351 to the debit of the extraordinary renewals account, without taking into consideration the large proportion of the cost of rebuilding the chief offices and show-rooms, which was in the nature of a renewal, and must, therefore, be paid for out of revenue. He reminded the proprietors that at the last half-yearly meeting, he had stated that owing to the favourable contracts which had been entered into for coal and oil, subject to deliveries being obtained, the Directors hoped to get through the half year without having to raise the price of gas. This hope had been realized; and, as far as could be seen, no advance would be necessary during the current half year, and every nerve would be strained so as to avoid such a necessity. Should the Directors' efforts meet with success, they would indeed have something to be proud of. Whether it would be necessary to increase the price next year, he was unable to say. A further source of difficulty which the management had experienced was the shortage of labour. Notwithstanding a substantial increase in wages having been granted to every class of employee, since the commencement of the war there had been over 500 changes among the workmen—equivalent, approximately, to the total number employed. Up to the present 17 of the staff and 155 workmen had joined the forces. Remarking on the new chief offices and show-rooms which the shareholders were invited to inspect, he stated that the premises were admirably adapted to the efficient conduct of the Company's business, and explained that the show-rooms had been designed with the object of giving to the public practical demonstrations of some of the many purposes for which gas was now used.

The dividend was declared, the customary donations were granted to the Portsmouth, Portsea, and Gosport Hospital, and to the Portsmouth Eye and Ear Infirmary, and the usual distribution of coke to the poor during the coming winter was authorized.

Replying to a vote of thanks to the Directors, officers, and staff, proposed by Mr. F. Blake, the Chairman stated that, from what he had already said, the shareholders would appreciate how strenuous and anxious the past half year had been for all concerned. For Mr. Ashworth, in particular, it had been trying beyond measure; and his utmost efforts had been necessary in meeting the many difficulties that arose. Mr. H. A. Stibbs (the Secretary), too, had been unremitting in his attention to the Company's interests; while the ready manner in which the staff carried out the increased duties imposed on them, in consequence of the reduced numbers, was highly appreciated by the Board.

SALISBURY GAS COMPANY.

Mr. Humphrys' Retirement.

The Annual Meeting of the Company was held last Wednesday—Mr. George Fullford in the chair.

The Chairman, when moving the adoption of the report and accounts, together with the payment of the usual dividends, said that the effects of the war had so disturbed and upset everything that any attempt to compare the working results with those of previous years was out of the question. The increased cost of coal and materials of all kinds, of labour, the gratuities to wives of men on active service (no one could say that gasmen had not given their full quota to the service of the country), the delay in coal delivery in the winter, and congestion on the railways had caused, and was causing, great inconvenience and expense. The past year had been most trying for all concerned, especially for the Manager. In several respects, however, business had been good. The sales of gas showed a substantial increase; and the dividends had been fairly earned on the year's working. New machinery was in course of erection, and when it was completed it would greatly facilitate the manufacturing operations. Although somewhat costly in the first place, it would prove economical in practice and of great assistance to the workmen. They were already aware that Mr. Norton H. Humphrys, who had been in the service of the Company for over thirty years—the last twenty as Engineer and Manager—had tendered his resignation. The Directors accepted the decision because they felt that the time had arrived when he might reasonably look for rest and relief from his onerous duties. His superior knowledge of the scientific as well as the practical part of his profession would still be in request, as it had been in the past, and as cheerfully devoted to the advancement of the gas industry. He would be succeeded on Oct. 1 by Mr. William Fielden, who had been for thirteen years Manager of the Staines and Egham Gas Company (now amalgamated with the Brentford Gas Company), and in addition had had seven years' gas-works experience at Todmorden, Aldershot, and Beckton. He held first-class gas engineering honours, and came with excellent credentials from the Directors at Staines and others with whom he had been associated. Last, but decidedly not least, the Directors desired to acknowledge the assistance of their valued Secretary, Mr. Whitehead, of Mr. Humphrys, and of the office and works staff. It might, perhaps, be invidious to mention other names; but there were others who had loyally considered the interests of the Company, to whom their thanks were also due, and were heartily tendered.

The motion was adopted, as were others declaring the dividend and re-electing the retiring Directors and Auditor. Next there was passed a vote of thanks to the Chairman, Directors, and officers of the Company for their services during the year.

Mr. Haskins having replied on behalf of the Board,

Mr. Humphrys said he could not too strongly support the recognition of the work done by the staff under the special conditions that had obtained. Going back over the last fifty years, the general operations had never experienced such an all-round upset, which, being quite unexpected, found them quite unprepared. They had been able to make arrangements for meeting the altered conditions to some extent; and with the help of the new apparatus now coming into use, his successor would, he hoped, have a less strenuous time. Speaking on his own behalf, he desired to acknowledge the kindly reception that had always been accorded to him at the shareholders' meetings.

The Waterford Gas Company have intimated an increase in the price of gas from 3s. 4d. to 3s. 9d. per 1000 cubic feet, owing to the increased price of coal.

MANCHESTER CORPORATION GAS DEPARTMENT WAR BENEVOLENT FUND.

On Aug. 11 last year, shortly after the outbreak of war, a meeting of the principal officials of the Manchester Gas Department was held, presided over by Mr. Frederick A. Price, the Superintendent; and it was decided to open a fund in connection with the National Relief Fuud, and make regular weekly contributions thereto during the continuance of the war.

Since the inauguration of the fund, the staff at the Town Hall have contributed to it £1042 11s. 2d., and the staff and men at the works, £1879 18s. 5d. Owing, however, to a large number of the contributors holding the opinion that there was no lack of employment in the district, and no evidence of acute distress necessitating continued efforts to ensure a large immediate income, it was decided last month to cease forwarding the weekly collections in the department to the Lord Mayor's National Relief Fund. But, having regard to the fact that so many of the employees in the department had answered the call of their country, it was decided, at a recent meeting of the principal officials, to establish a benevolent fund for the benefit of the members of the staff and workmen who might be injured in action, or to assist the dependants of the fallen. The new fund is entitled the "Manchester Corporation Gas Department War Benevolent Fund," and the Trustees are Mr. F. A. Price, the Superintendent of the Department, Mr. T. Williams, the Cashier in the Department, Hon. Treasurer, and Mr. G. W. Kaye, Hon. Secretary.

Weekly contributions are to be made by the employees in accordance with the subjoined scale; and by this means it is hoped that a substantial sum will be available for the Committee administering it. The scale (which was in operation for the relief fund) is, of course, subject to periodical revision as may be determined:

	Weekly Contribution.
Employees receiving under 10s. per week	1d.
,, ,, 10s. and under 20s. per week	2d.
,, ,, 20s. ,, 30s. ,,	3d.
,, ,, 30s. ,, 40s. ,,	4d.
,, ,, 40s. ,, 50s. ,,	5d.
,, ,, 50s. ,, 60s. ,,	7d.

Officials receiving—	Per Cent.
60s. per week and under £200 per annum	1¼
£200 per annum and under £300 ,,	1½
£300 ,, ,, £400 ,,	1½
£400 ,, ,, £500 ,,	1¾
£500 ,, ,, £600 ,,	1¾
£600 ,, ,, £700 ,,	2
£700 ,, ,, £800 ,,	2
£800 ,, ,, £900 ,,	2¼
£900 ,, ,, £1000 ,,	2¼
£1000 ,, ,, £1100 ,,	2½
£1100 ,, ,, £1200 ,,	2½
£1200 ,, ,, £1300 ,,	2¾
£1300 ,, ,, £1400 ,,	3
£1400 ,, ,, £1500 ,,	3
£1500 ,, and upwards ,,	3

WAR BONUS QUESTION AT OLDHAM.

An Unusual Position: Workers Decline More Money.

A Special Council meeting was held at the Oldham Town Hall on Wednesday last to consider the question of granting a war bonus to the employees. As previously reported [*ante*, pp. 45, 307, 359], the original demand of the men was for a war bonus of 5s. for gas and water employees; but it was afterwards extended to other Corporation departments—a Special Committee being appointed to review the whole question. This Committee recommended an advance of 2s. per week to all employees above 21 years of age receiving less than 28s. per week, and 1s. to those receiving 29s.—confining the bonus to those whose wages with the advance will not exceed 30s. per week.

Prior to Wednesday's meeting this offer had been unofficially rejected by a large number of workmen who are members of the Gas Workers' Union and the Municipal Employees' Association. They pointed to the fact that last March (when the question of a 5s. bonus was first raised) the Council twice refused their demands; and they now threatened to strike unless their application was favourably considered or referred to arbitration. In the course of a letter addressed to the Town Clerk on Tuesday, Mr. J. R. Clynes, M.P., the General Secretary of the Gas-Workers' Union, wrote stating that those concerned in the original application had decided not to accept the proposed offer; and he further pressed their claims. The letter stated that if the offer of the Special Committee was confirmed by the Town Council, "the difficulties of reaching a settlement by negotiation will be increased, as you may not find it easy to reverse a decision which the men are quite unable to accept. . . . I have to state that the men are willing to accept an advance of 3s. per week, which is the advance already conceded by the Corporation to the higher paid tradesmen and artizans in the Corporation employment . . . and that it dates back to the time when the advance was given by the Corporation to the skilled workmen referred to."

At Wednesday's meeting the position of matters was discussed for an hour and a half. Mr. Clynes' letter was submitted to the meeting; and finally the members decided to approve the recommendation of the Special Committee [reported above]. The Mayor (Councillor Lees) said it was regrettable the decision of the Special Committee had been considered by the Trade Unions before the offer was formally made by the Council. In the past, the Council had acted towards their employees in a manner which had commanded the respect of the employees. The Corporation had gained a reputation throughout the country for dealing equitably, and in many respects generously, with their employees; and they did not want this pleasant feeling to pass away. But they (the Council) also represented the ratepayers, who included tradesmen and shopkeepers who were badly hit by the war, and the working classes, many of whom were very poor indeed. They felt that the offer of 2s. war bonus was a fair one. He reminded them that in the cotton trade the operatives obtained an advance (by arbitration) of 5 per cent.; and the Council were offering labourers an advance of 7½ per cent. The minimum wages paid to labourers by private employers was formerly 20s. per week; and these had obtained a war bonus of 3s. per week. But the minimum paid by the Corporation was 25s.; so that with a bonus of 2s. per week (as suggested by the Special Committee) the Corporation labourers were being paid 4s. per week more than fellow-labourers in private employment.

The number of men employed by the Corporation at a wage of less than 30s. per week is 1278. The 2s. per week bonus represents an increased annual expenditure of £6604. In addition, war allowances to men who have enlisted amount approximately to £14,664 per annum. If those now concerned in the proposed bonus were granted an increase of 3s. per week, it would mean an additional expenditure of roughly £10,000 per annum; and if the bonus was granted to those receiving more than 30s. per week (as was originally suggested), the amount would be about £20,500. In the "JOURNAL" for March 23 (p. 760) the number of workmen affected in the Gas and Water Departments by this application was given as 785—no fewer than 680 of these being in the Gas Department. The term "workmen" in this case included clerks.

CLONMEL GAS-WORKS IMPROVEMENTS.

The new retort house and equipment of up-to-date machinery at the Clonmel Gas-Works are now in working order. The retort-house is a concrete building, containing four beds of seven retorts, supplied by Messrs. Drakes Limited, of Halifax. These are capable of producing 40,000 cubic feet more gas per day than the old ones, and on a more economical basis. Some of the accessory plant was supplied by Messrs. James Milne and Sons, of Edinburgh. The old retorts are to be taken down, and the ground occupied by an additional coal-store. A new store, just erected, is within easy reach of the river boats; and to facilitate stoking, there is a lift by which full trolleys of coal are hoisted, so as to be brought on rails to the doors of the retorts.

The improvement in manufacture is shown by the fact that 12,000 cubic feet of gas per ton of coal are obtained in the new retorts, compared with about 9500 feet in the discarded ones; while the amount of coke available will be increased to about 10 cwt. per ton of coal carbonized, as compared with only 8 cwt. per ton formerly. About 12 per cent. less coal will be used in future. The daily output of gas has now been raised to over 200,000 cubic feet, which is ample for all the requirements of the town. The high price of coal has entailed an increase by 6d. per 1000 cubic feet in the price of gas; but when normal conditions are restored, the Gas Committee hope to make important concessions to encourage the general use of gas, not only for lighting, but for cooking and heating purposes. The Committee were fortunate in having as Consulting Engineer during the recent improvements Colonel Henry O'Connor, now Commanding the Forth R.G.A., who, during a brief visit, has expressed himself as most gratified with the efficiency of the retorts and the manner in which the works were supervised by the Manager and Secretary, Mr. Richard Kneeshaw.

It may be mentioned that the Clonmel Gas-Works were originally started by the British Gaslight Company in 1824. Sixteen years later, other works were started by the Clonmel consumers; and an amalgamation took place in 1880. Eventually, the Council purchased the undertaking, at a cost of £13,000; £3000 more being spent on buying outstanding interests and £2000 on much needed improvements. In the history of the undertaking there has been only one failure of the town lighting, which was due to the flooding of the underground portions on Christmas morning, 1895; but the interruption lasted only for a few hours.

Gas Poisoning Case at Belfast.—John Ritchie, an elderly man who lived alone, has been found dead in his house in Summerhill Street, Belfast, from the effects of gas poisoning.

Camborne Gas Company.—The annual meeting of this Company was held yesterday (Monday) week, with Mr. Charles Bryant presiding. Considering the abnormal times through which they were passing, the Directors are very satisfied, he said, with the statement of accounts presented; and he hoped the shareholders generally would share in their satisfaction. The Board had had to increase the price of gas by 3d. per 1000 cubic feet—making it 5s. gross—as from Ladyday last; and in view of the fact that the deliveries of coal in store for the six months ending June 30 cost 13s. 4d. per ton more than six years ago, and 6s. more than last year, a further 3d. would be added at Michaelmas. As compared with six years ago, the make of gas per ton of coal carbonized reached the very satisfactory figure of 12,012 cubic feet, against 10,265 feet; and this combined with the saving in leakage, or gas unaccounted for, had enabled them to sell over 5 million cubic feet more gas with a consumption of 25 tons less coal. A dividend of 4½ per cent. was declared. Replying to a vote of thanks, Mr. S. J. Ingram, the Company's Consulting Engineer, said he would not care to look forward to another winter like the last one. Any lapse which might have occurred in supplying gas to the district would have been disastrous. Although there were great difficulties experienced, yet the supply was not curtailed in any way; but at one time they found themselves within forty-eight hours of actually being without coal—during the time the Government demanded the railways. They would start next winter with a larger supply of coal than they ever had before; but the price was considerably in excess of previous years.

SUICIDE OF A GAS COMPANY'S OFFICIAL.

The Accountant of the Gas Light and Coke Company.

Last Friday an inquest was held by Dr. Waldo, at the City Coroner's Court, on the body of Mr. William Blakey, 42 years of age, who held the position of Chief Accountant to the Gas Light and Coke Company, in whose employment he had been for twenty years.

Evidence was given that the unfortunate man's accounts were absolutely correct; and it was stated that he suffered from delusions. He had lived for some time at Chisholm Road, Croydon, and leaves a widow and two children.

A brother of the deceased, Mr. James Blakey, a retired civil servant, of Purley, stated that his brother had suffered from nervous depression; but there was nothing much the matter with his health. He laboured under the delusion that he was followed by detectives. He first mentioned this about three months ago. He also had an idea that everybody hated him; but this was a subsidiary delusion. He had never threatened suicide; and the circumstances of his death came as a great shock to witness and the family. The deceased had no financial or other troubles; and he lived on the most affectionate terms with his family.

Further evidence showed that Mr. Blakey had not been to business since May. He had been under the care of Dr. Newby, of Croydon, and had also been seen by Dr. Mott and another brain specialist. On the previous Wednesday he told his wife that he was going for a walk "just going down the road"—leaving the house at 11 30 a.m. Three hours later he was found to have shot himself through the brain with a revolver while in an underground lavatory at Ludgate Circus. A new magazine pistol lay at his feet. In his pocket was found an envelope bearing the following: "My darling Ethel (his wife),—God bless you and keep you in His care." In a letter addressed to the Secretary of his Company, marked "Private and Confidential," the deceased wrote: "Dear Sir,—By the time you receive this letter I shall be dead."

The Coroner said that in the letter deceased denied that his supposed delusion was a delusion.

Mr. Henry Rayner, the Secretary of the Company, said that Mr. Blakey had been an officer of the Company for twenty years, and was a most able man at his work. He was very highly esteemed by the Directors and all his colleagues. His work had been much more arduous owing to the war, and he had felt the strain. His accounts were absolutely correct, witness added.

The Jury returned a verdict of "Suicide while of unsound mind."

FATAL ACCIDENTS IN GAS-WORKS.

At the Co-operative Institute, Woolwich, last week, an inquest was held on Alfred James Wheatley, aged 24, who died in the gas-works at Woolwich Arsenal. William Bade, a stoker at the gas-works, said on the night of the 11th inst. he was at work in the retort-house in charge of a new stoking machine, which had only been in use for four weeks. Deceased's duties were to open the lids while witness moved the machine from retort to retort. The machine was close to the wall, and deceased stood on the platform to get round it, when witness heard a cry, and found Wheatley pinned by the machine to the wall. Witness got him out, and he was taken to the Arsenal Hospital. Witness had been engaged on retorts for twenty years; but the appliance they were using had been newly erected. In reply to the Factory Inspector, witness said that the machine was not dangerous so far as its working was concerned; but it was fixed close to the wall. There were only 3 inches between the machine and the wall; but there was a recess, and Wheatley tried to take advantage of it to get under. Witness did not see him doing so, and started the machine. It was not possible to pass behind the machine except when it was opposite the recess in the wall. Mr. Asworth, the Inspector, in reply to the Coroner, said it was not intended that these recesses should form a means for going behind the machine. They were regular traps; and he had suggested that they should be filled up level with the wall. Mr. Hingston, for the War Department, said he understood that this suggestion was being carried out. John Tobin said he was working in company with the deceased and successfully passed behind the machine when it was stationary. Wheatley was following him; but the machine having been restarted he was caught and nipped. A walk of 50 or 60 yards was saved by taking advantage of the recess. It was dangerous to use the recesses; but as quickness of movement was necessary in opening and closing the lids of the retorts, they had used them instead of going round. Lieutenant Eves, of the Royal Army Medical Corps, said that when admitted to the hospital Wheatley was suffering from shock, contusion of the pelvis, and internal hæmorrhage. The latter and the shock caused death in a few hours. The Jury returned a verdict of "Death from misadventure."

Before the Coroner for the Camberwell District last Thursday, an inquest was held concerning the death of Horace Townsend, a leading hand in the distillation department of the South Metropolitan Gas Company, Old Kent Road. The widow said that she last saw deceased alive on the Saturday morning, when he left home for work. He was then in his usual state of health. Mr. Thomas Gibson, Works Superintendent, stated that about one o'clock the previous Saturday afternoon, Townsend, who was about his ordinary duties, suddenly collapsed and fell in the still-room. He was carried unconscious into the open air and artificial respiration was resorted to by the Company's ambulance men pending the arrival of a doctor, who pronounced life extinct. It was subsequently found that deceased had omitted to open the air-gauge box before starting the still to work, and had no doubt inhaled the vapour which had accumulated. There was no explosion whatever. He understood the work well. Dr. Ward stated that the cause of death was asphyxia from inhalation of gas. Townsend no doubt omitted to take the usual precautions. A verdict of "Accidental death" was returned.

Last Wednesday, Sir Thomas Bramsdon, the Borough Coroner, held an inquiry at the Town Hall, Portsmouth, as to the cause of the death of Thomas Alfred Atkins Hall, a workman in the employ of the Portsea Island Gas Company, who died as the result of an accident he sustained at the Hilsea Gas-Works the previous Sunday. The evidence showed that the duties of deceased—who was a water-gas operator, who had been in the employ of the Company 15 or 16 years—were in connection with a lift which hauled up skips of coke on to the operating floor from the ground below. Mr. George Barrett, the Works Manager at Hilsea, said one man was quite enough to deal with the skip. At about 8.15 on Sunday evening the skip was found turned upside on the operating floor, and deceased was lying across the top of it; his head being jammed between the skip and the wall. The lift must have been lowered by some means for the accident to have happened. The skip might have tumbled over the edge of the lift, and the deceased have fallen over the top of the skip. There was nothing the matter with the lift. Mr. J. D. Ashworth, the Engineer and Manager of the Company, expressed the opinion that the floor of the lift might have been lowered for ventilating purposes, and that the deceased forgot this. Dr. Jeans, who was called to the works, found that the deceased had expired on his arrival. As the result of a post-mortem examination, he attributed death to laceration of the brain due to the accident. The Coroner, in summing up, remarked on the fact that in the great number of years he had been Coroner there had been so few accidents at the gas-works. A verdict of "Accidental death" was returned. On behalf of the Directors, Mr. Ashworth expressed deep sympathy with the widow and friends of the deceased, and remarked that this was the first accident that had occurred since he had been Manager—about 17 years.

POISONED BY "T.N.T." FUMES.

First Death Reported from this Cause.

The Coroner for the Southwark district last Friday inquired into the death of Albert Victor Winter (aged 44), a worker at the Woolwich Arsenal, from poisoning by trinitrotoluene. The widow, in the course of her evidence, stated that her husband went to work at the Arsenal in April. About two months ago she noticed that he was turning yellow, and thought he was suffering from jaundice. He told her he was engaged in boiling down a high explosive called "T.N.T.," and said he would ask to be taken off the work. He gradually became worse, and died in Guy's Hospital. Arthur John Turpin, assistant foreman in the High-Explosives Factories at the Arsenal, said deceased was employed in filling shells. The "T.N.T." crystals were put in a tank, and he had to boil them down and draw off the liquid. The fumes might be dangerous; but there had not been a case of poisoning from them previously. Respirators and gloves were provided for the men; but they did not always use them. When deceased showed signs of contact he was seen by the Arsenal Doctor, who, however, returned him to work.

Medical evidence by Dr. C. Dean, of Guy's Hospital, was to the effect that death was due to acute atrophy of the liver, caused by poisoning from the fumes of "T.N.T." Dr. Collis (Inspector of Factories) told the Coroner that knowledge concerning the dangerous properties of "T.N.T." had only come to light quite recently. The nitrobenzines, of which it was one, had been recognized to be poisonous for a long period; and there were regulations governing their manufacture. The fact that there was danger from these fumes only came prominently before the Home Office in July last, and appeared to be in connection with exposure to the fumes during melting. Previously, when it was handled and used dry, certain symptoms of skin trouble developed; but there were no serious symptoms affecting the general health. This was the first death from this cause into which an inquiry had taken place. Suggestions had been made by the Home Office to guard against the danger; and these were being proceeded with. Owing to the pressure of work at the Arsenal, however, it was impossible to carry them all out in a few days.

A verdict in accordance with the medical evidence was returned; the Jury finding that death was due to misadventure.

GAS-FITTERS v. PLUMBERS.

Trade Jealousies.

For some time past the members of the Institute of Plumbers have taken strong exception to the introduction of separate classes for the teaching of gas-fitting; and recently the Executive Committee approached the City and Guilds of London Institute on the matter, because they feel that the classes are prejudicial to their interests. They strongly urge that gas-fitting ought to be exclusively confined to the plumbing classes.

The question was discussed by the Governors of the Plumbers' Institute at its meeting at Blackpool last week, when a report was submitted stating that a deputation had waited upon Mr. Morton Latham, the Chairman of the Technology Committee of the City and Guilds of London Institute, and laid their views before him. The deputation was well received; and it was promised that the position of the plumber would be fairly represented to the Committee controlling the various syllabuses issued by the City and Guilds Institute.

In the discussion which followed, the Secretary (Mr. J. W. Hirst) stated that the gas companies throughout the country were largely to blame for the creation of these classes for their employees. In many cases, they provided the teachers and gave prizes. So far, the classes were mostly confined to the South of England; but they were now spreading to the North of England, and he urged that strenuous opposition would be required if this development was to be combatted. Action had been taken at the Salford meeting of the Plumbers' Institute; and they were hopeful of good results. The members of the Plumbers' Institute feel, he said, that the gas companies are taking an unfair advantage of the plumbing trade, by encouraging their workmen to attend the classes—believing it will eventually lead to an undesirable encroachment on an important part of their business. One member stated that gas-fitting was a "big slice of the plumber's loaf."

RATE-AID FROM GAS PROFITS IN NEW ZEALAND.

A Protest from Wanganui.

In giving his report on the working of the Wanganui (N.Z.) gas undertaking for the past year, at the Borough Council meeting early in May, the Gas Manager (Mr. G. D. Stone) stated that, through various reasons, the profits were not as large as was at first anticipated; but considering the adverse circumstances with which they had had to contend during the year, he thought that the profits were fairly good.

After dealing with the various figures in the accounts submitted, Mr. Stone added that the whole of the new plant recently brought into operation was giving every satisfaction; and he then dealt with the question of the disposal of surplus profits and capitalization. These two questions, he remarked, having recently been brought into great prominence together with a certain amount of criticism of the management, was, he thought, sufficient to warrant him dealing with the matter at this juncture.

He said: I feel that I would be failing in my duty if I did not present the serious aspect of the question affecting the gas-works. This is a matter of far-reaching and of vital importance to the ultimate results of the works. I am aware that the using of the surplus profits for the relief of the rates is very fascinating from the councillors' point of view; but to continne on these lines must seriously affect the capital and profit.

The works, costing several thousand pounds, bought over from the Company after working a fair lifetime were considered to be too small or out of date; and practically the whole of the plant in the works was scrapped—thus largely handicapping the works from the commencement with over-capitalization. The output of gas more than tripled in ten years, and some portions of the plant again became too small. It was not scrapped, but must be sold at about half the original cost.

In a prosperous and growing town and district as we have here, the gas-works must be enlarged to meet the demand. Extensions cannot be carried on without means; and if the profits are otherwise used, borrowing must be resorted to. Borrowing means more interest to pay, and less surplus profits. After a lifetime of gas-works management, I have no hesitation in saying that the surplus profits should be used in extension of plant until such time as the handicap has been removed and the works well established. We live in an age of invention and competition; and it is possible that a new and cheaper illuminant may be invented at any time. You are anticipating introducing the electric light. This will cut into the most profitable part of our business, reducing our profits to a very considerable extent. It has been my endeavour to keep down the capital as low as possible; and my success in this line I am prepared to submit to any competent gas expert.

The question has been asked, Why have the profits not increased in proportion to the increase in business? The following statement will show the percentage of profits on capital invested each year for the last ten years: 1904, $16\frac{1}{2}$ per cent.; 1905 (price reduced to 5s. 6d., June, 1904), $11\frac{1}{3}$ per cent.; 1906 (price reduced to 5s, July, 1905), $7\frac{1}{6}$ per cent.; 1907, $10\frac{1}{2}$ per cent.; 1908, $11\frac{3}{4}$ per cent.; 1909, $8\frac{1}{2}$ per cent.; 1910, $9\frac{1}{2}$ per cent.; 1911, 10 per cent.; 1912, $12\frac{1}{2}$ per cent.; 1913, $14\frac{3}{5}$ per cent.; 1914, 14 per cent.; 1915, $11\frac{1}{2}$ per cent.

At the same time I would remind you that during the last eight years coal has advanced from 20 to 30 per cent.; ordinary labourers' wages, $12\frac{1}{2}$ per cent.; stokers' wages, $22\frac{1}{2}$ per cent.; gas-works plant and material, from 20 to 30 per cent. Notwithstanding these large disadvantages, we are selling gas at the same price. One may well inquire, Are there any other businesses doing this, that are paying?

I will take the year just closed (1914), and compare it with the year 1905—showing how the advance in prices cut into our profits. The advance on coal had increased our coal bill by £3127; our labour bill at the gas-works only £746; labour and material on maintenance £250—making a total of £4123. This is not all, but sufficient to show to a large extent how the advance in cost has reduced our profits. I have no hesitation in saying that it is only through the better results obtained from the coal that we are able to make the present profits. The following is the average make of gas per ton of coal carbonized, for the last ten years: 1905, average 10,307 cubic feet per ton; 1906, 11,287 feet; 1907, 10,771 feet; 1908, 11,333 feet; 1909, 11,597 feet; 1910, 12,731 feet; 1911, 13,631 feet; 1912, 13,422 feet; 1913, 14,522 feet; 1914, 14,804 feet. Two-thirds of the mileage of our gas-mains are extended to the suburbs, which were to pay 7s. and 7s. 6d. per 1000 cubic feet, which was barely a paying proposition at that price. But having come into the borough, they are supplied at the same rate—namely, 5s. per 1000 cubic feet, reducing the profits by about £1000 per annum. Public lighting has been extended, for which the Gas Department receives about half the actual cost. Tar is sold to the borough below market value; and gas and coke to the trams on the same lines—reducing our profits by another £1000 per annum. The Manager is not consulted; nor has he any control over these matters.

Our charge for gas will compare favourably with any other works in the Dominion—from 4s. 3d. to 5s. per 1000 cubic feet. There is only one gas-works selling below this price for lighting—viz., 4s. 9d.; they being in a position to buy their coal at about 4s. per ton less than we can. The difference in cost of coal more than compensates for the difference in the charge for gas. The quality of our gas compares favourably with any other town; and the yield per ton of coal also.

While on this subject, I would like to quote one of the most successful municipal gas-works in the world—Widnes. Gas is sold there for 1s. per 1000 cubic feet, and in some cases at 10d. From the time of the Municipality taking over the works, more than thirty years ago, the surplus profit has been used to reduce the capital, and has almost wiped out the whole capital. These works light the borough free.

Our coal-stores are only large enough to carry about six or seven weeks' stock for the winter months. Last year I suggested preparing a suitable place in the yard to stack (say) 1000 tons outside, as in the event of a strike or accident we would not be on our beam-ends at once. My suggestion was not acted on. I must again apply for permission to considerably increase our stock of coal during the winter months. The result of carrying small stocks we realized last winter, when having to buy any coal that was available at increased prices.

Our carbonizing plant being extended, we are now in a position to push our business in gas-cookers. I would suggest that from £300 to £500 be expended in gas-cookers to be fixed free of cost, provided a given quantity of gas is consumed per month. Details can be arranged if the suggestion meets with approval.

The report was referred to the Gas Committee for consideration.

PRODUCTION OF COAL-TAR COLOURS IN AMERICA.

[From the "Board of Trade Journal."]

According to recent issues of the United States "Commerce Reports," the effects of the dyestuffs famine in the United States are becoming more and more apparent each day. In some instances textile mills are forced to close-down for the time being, until new supplies of dyes can be obtained. This is especially the case in works consuming large amounts of indigo, the lack of which has become very acute. Manufacturers are now bringing out brown denims, instead of the familiar blue fabric; but merchants and consumers are reluctant to accept the substitute. Similar modifications are being made in a multitude of cases; the primary purpose as a rule being to reduce to a minimum the actual amount of dyestuffs used. The possibility of securing fairly satisfactory shades by the use of vegetable dyestuffs has been demonstrated; and the consumption of logwood, fustic, quercitron, cutch, hypernic, &c., has become very large.

In the meantime the few American manufacturers of coal-tar colours are steadily expanding their plants, and are producing dyestuffs in quantities hitherto unknown. Equally noteworthy is the steady increase in the manufacture of intermediates—aniline oil, betanaphthol, para-nitraniline, &c.—by the firms lately started in this field. Under the circumstances, widespread interest is attached to concerted action on the part of leading manufacturers at Bâle (Switzerland). The firms in question find themselves in a serious dilemma. They are now practically cut off from all supplies of coal-tar crude and intermediate compounds, and may soon be forced to close their vast establishments for an indefinite period. In face of this threatened danger, they are turning to the United States for assistance. Fully aware of the latent possibilities in the American coke industry to produce coal-tar crude products in enormous quantities, and also of the great consumption of foreign-made dyes in the United States, the Swiss colour firms now seek to secure an ample supply of American crude products, and to pay for them in finished dyes.

A NEW HIGH-GRADE FERTILIZER.

An engineering correspondent of the "Yorkshire Post," writing last Tuesday, said: It is believed that the next big development in artificial fertilizers will be the commercial manufacture of a high-grade synthetic salt containing nitrogen and phosphorus in large and well-balanced percentages. Chemists in several parts of the world are at work upon the production of such a fertilizer. The line of approach most in favour is the fixation of atmospheric nitrogen; the conversion of the nitrogen into ammonia; and the combination of the ammonia with phosphoric acid, to give ammonium phosphate. The fixation of atmospheric nitrogen can be done by several processes, chief among which is the cyanamide process. In this process nitrogen gas is first obtained by liquefying air, and then raising it to a temperature at which the nitrogen will boil off, leaving the oxygen behind. Calcium carbide is then placed in contact with the nitrogen, and absorbs the gas to the amount of about 20 per cent. of its own weight. The result is cyanamide. The cyanamide is now mixed with water, which, on being heated under high pressure, is converted into ammonia; and the ammonia is finally combined with phosphoric acid to give ammonium phosphate. It is reported that ammonium phosphate containing over 13 per cent. of ammonia and 50 per cent. of phosphoric acid is now being produced commercially, although up to the present only on a magnified laboratory scale; and the salt, which thus contains over 60 per cent. of plant food, the bulk of the remainder being chemically combined water, is said to possess in a high degree the many requisites of a good fertilizer—being non-hygroscopic, non-poisonous, finely granular, not subject to too rapid percolation, and being readily assimilable by the plant. When mixed with the high-grade potash salts available it will make, it is claimed, a complete fertilizer some six times as concentrated as the average grade sold to-day. For a time it was thought that a highly suitable compound of ammonia and phosphoric acid could be made by treating phosphate rock with nitric acid; but the product of this process proved to be too hygroscopic and too low in contained plant food. Two methods of manufacturing ammonium phosphate compounds from ammonia obtained by the cyanamide process and phosphoric acid are undergoing development. One of these is applicable wherever cheap sulphuric acid may be had. The second, which employs the electric furnace in driving off phosphorus from the phosphate rock, is applicable only where cheap water power is available. The importance of these developments can hardly be over-estimated, in view of the fact that one of the most pressing problems of the future will be that of supplying plant food to an impoverished soil.

Additional Capital for the Melbourne Gas Company.—On June 30 the shareholders of the Metropolitan Gas Company of Melbourne, at an extraordinary general meeting, gave the Directors authority to raise, as and when considered necessary, a sum not exceeding £50,000, by the creation of 10,000 additional shares of £5 each, and conditionally upon the issue of the shares to borrow upon debentures such sums as they think fit up to the amount mentioned. At the meeting the Chairman stated that the Board did not intend to issue the shares until July 23, which would be two days after the publication of the Company's half-yearly balance-sheet, as the information contained in it would help shareholders to assess the value of the new stock. The shares had to be offered by public auction, in conformity with the Company's Act.

HOT-WATER SUPPLY IN WORKMEN'S HOMES.

A Practical and Economical Method Wanted.

Discussing in the "Manchester Courier" the problem of hot-water supply in dwelling-houses, "Medical Officer of Health" says it has been solved, so far as the better-class houses are concerned, by the gas boiler and circulating systems, but asks, What about the working classes, and hot water for the working man's home? Considering this matter it is remarked:

> The problem becomes a very difficult one, but not one that cannot be overcome. Very little cleaning and washing can be done without hot water—at least in a temperate climate. There is personal washing and clothes washing, and the scrubbing of floors and tables—all require soap and hot water. For the very poor, living in one room, the coal fire is used for nine out of the twelve months of the year; the heat from the fire warming the room and the people of the room, boiling a kettle and a saucepan. Attached to the fire grate may be a side boiler with a tap, from which hot water is obtainable for washing; but often no such boiler is attached, and cleanliness suffers, the housewife despairs, and matters go from bad to worse, with the usual results—a slummy room and the consequent visiting of the nearest public-house by both man and wife.
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> In tenement buildings the difficulty is overcome by a central supply of hot water, common to the whole of the tenements; and the fuel used for this central supply is either coke or gas. A similar arrangement might be made for rows of houses, with the establishment of common wash-houses, where not only could washing of clothes be done, but also a copious supply of hot water obtained on demand. The cost of such an installation could be spread over the whole of the houses using the same, and would only amount to a very few pence per family. The educational value of such an installation would be immense.
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> In Huddersfield there are gas-heated coppers in the small houses as well as gas-cookers, both fed by the "penny-in-the-slot" methods; so that the matter is receiving the attention of those interested, and experiments are being carried out. Unity is strength, and the final solution of the problem will probably be found in co-operation and amalgamation—the institution of central stations from which the various consumers and users will be supplied with hot water for purposes of cleaning and washing. It is manifestly unfair to expect a working man's home to be kept clean if no means are provided for the supply of hot water for cleansing, and, as education increases, cleanliness will become more and more essential, and be more and more insisted upon by all, so that the need for greater facilities for obtaining the means of guaranteeing such cleanliness will be forthcoming, and Housing of the Working Classes Committees and gas companies will have to devise some practical and economical method of meeting the demand.

In Manchester, it may be added, part of the problem has been solved by the Corporation by the provision of public wash-houses. Perhaps the Corporation soon will "lay on" the hot water!

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

An interesting report on the public lighting of Aberdeen has been issued by Mr. Alexander Forbes, the Lighting Inspector for the city. It traces the development—and incidentally speaks of the recent curtailment—of lighting in Aberdeen. Mr. Forbes expresses regret that, owing to the war crisis, public lighting had to be so much reduced that by the end of the season "lighting" was almost a negative term. The reduced lighting had had its compensating effects, in respect that there had been a pronounced saving in the department. For gas and electric current alone the charges were £5352 less than the previous twelve months' figures Adding to this mantles, globes, carbons, &c., the saving amounted to a very considerable sum. A comparison of the figures of the consumption of gas and electricity for 1913-14 and 1914-15 shows the saving due to restricted lighting. The total figures for gas in 1914-15 amounted to £911, compared with £4389 in 1913-14—a decrease of £3478. The electricity total in 1914-15 was £524, and in 1913 14, £2398—a decrease of £187.

Many gas committees in Scotland are cutting down their estimates for the forthcoming year. At Coatbridge there is a reduction of £800 on the street lighting for the present year. At last Thursday's meeting of the Dundee Town Council, some discussion took place in connection with the gas estimates, which, it was stated, had been reduced from £9995 to £8230. The original estimate in respect of public lamps was £4194; and it was proposed to cut this amount down to £3000. A member took exception to the proposal, which, he remarked, did not seem to be accurate financing. The actual expenditure last year was £11,000; and they were now calculating on only £8230. The Treasurer said the estimate had been reduced after inquiry by the Lighting Committee. Only half of the public lamps would be lit this year, instead of two-thirds as last year; and the Committee agreed that this would meet the requirements of the military authorities. After some further talk, the estimates were approved.

Messrs. W & J. Knox, Limited, who supply gas to the town of Kilbirnie, have increased the price from 4s. 7d. to 5s. 5d. per 1000 cubic feet. At Airdrie the price of gas has been raised to 3s. 4d. per 1000 cubic feet—an increase of 5d.

The Barrhead Gas Company have just installed the Alder and Mackay automatic system of street lighting. The plant has been tested, and is completely successful—all the street lamps being lit within a few seconds. The four-wave method has been adopted—this permitting of a proportion of the lamps being extinguished about midnight, and relit early in the morning.

The Directors of the Liverpool Gas Company have declared an interim dividend of 2½ per cent. on the ordinary stock for the half year to June 30, payable (less income-tax at 2s. 1d.) on Friday last.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Aug.* 23.

The market is still steady and without any new features. Continental users are inquiring for pitch for next season; but the uncertainty as to the ultimate cost of freight makes it somewhat difficult to arrange business at present. In addition to the light products of tar, the position of creosote and naphthalene continues strong. There is no change in prices to record.

With regard to sulphate of ammonia, it is understood that export licences for this material are now being obtained in a shorter time than formerly, and it is anticipated that stocks awaiting shipment at some ports will soon disappear. The quotation remains at £14 8s. 9d. per ton net, for 25 per cent. quality, filled into buyers' bags at Makers' works.

Tar Products in the Provinces.

Aug. 23.

There is no alteration in the market for tar products. Very little business has been done in pitch, though there has been one or two inquiries from France during the past week. Solvent and heavy naphthas are in fair demand, and prices are well maintained. Creosote is quiet, and further sales are reported at reasonable figures.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 6d. to 25s. 6d. Pitch, East Coast, 22s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. Clyde. Benzol, 90 per cent., North, 10½d. to 11d.; 50-90 per cent., naked, North 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3d. to $3\frac{1}{16}$d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 6d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Aug.* 21.

During the past week there has continued to be a drooping tendency in the market for this material, and it has only been possible to effect sales by making a further concession in prices. Demand from abroad has remained small, and middlemen in this country apparently have ample supplies to meet their present requirements. The closing quotations are £14 10s. per ton f.o.b. Hull, £14 11s. 3d. f.o.b. Liverpool, and £14 12s. 6d. f.o.b. Leith. For October-March or January-June delivery, in equal monthly quantities, several makers are now willing to accept a little below £15 per ton at the ports, but not much interest has been shown in the forward position.

Nitrate of Soda.

This market has hardened still more, and the values are now 13s. per cwt. for ordinary, and 13s. 3d. for refined quality, on spot.

Sulphate of Ammonia.

From another source it is reported that this market has continued very quiet throughout the past week, and several lots have been offered at to-day's prices without finding buyers. Outside London, makes are quoted at £13 17s. 6d. to £14; Hull, £14 10s. to £14 12s. 6d.; Liverpool, £14 15s.; Leith, £14 17s. 6d.; Middlesbrough, £14 10s. to £14 12s. 6d.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is quieter, and for some classes of fuel the prices are slightly lower. There is a scarcity of steamships, and there is also a sparing issue of licences for export, so that the market has felt the influence. In the steam coal trade—which is so largely an export trade—the market is dull for the time, though fuller arrivals of steamers would improve it. Best Northumbrian steams are from 20s. 6d. per ton f o b for this month's delivery; and second-class steams are quiet at 16s. 6d. per ton. Steam smalls are on the whole meeting a steady demand, and the current prices are from 13s. 3d. to 15s. per ton f.o.b. There are at times higher prices forward asked. In the gas coal trade, the price has fallen, owing to the influences mentioned above, and best Durham gas coals are now quoted at about 20s. per ton f.o b. Second-class gas coals are 17s. to 17s. 6d. per ton; and "Wear Specials" are near 23s. per ton f.o.b. The production is fairly good, and deliveries are better on the long contracts, where there is the needed prompt tonnage and the licence for export. Freights have stiffened somewhat, and about 7s. 3d. is the rate for gas coal Tyne to London, and 15s. to Rouen. Little is doing in new contracts, and the uncertainty as to actual prices has interfered with forward sales; but it is the general impression that home needs will have more attention than a few months ago. On the other hand, enlisting is still lessening work at the collieries, so that the prospect for winter supplies of gas coal is not the brightest. Coke is steady. Gas coke is not yet in heavy supply, though slowly increasing. Good gas coke is quoted from 25s. 6d. to 27s. per ton f.o.b. in the Tyne.

Brighton and Hove General Gas Company.

The report of the Directors of this Company, issued in anticipation of the half-yearly meeting of the proprietors on Friday, at the London offices, Great Winchester Street, E.C., states that, in comparison with the results for the half year ended June 30, 1914, the sale of gas showed an increase last half year of 50,519,000 cubic feet, or 6·8 per cent., and the revenue from residuals an increase of £6340—the latter being due to the larger quantities of coke and breeze produced for sale, and to an improvement in the prices realized. The enhanced cost of freight, coal, and all other materials used in the manufacture and distribution of gas, the war bonuses paid to workmen, and the allowances made to dependants of employees engaged with the forces represented a serious addition to the charges which the Company have to meet. These additional burdens, the report continues, have not yet been fully felt; but the Directors have deemed it necessary to increase the price of gas throughout the Company's limits of supply by 3d. per 1000 cubic feet as from March 31 last. The profits for the half year were £30,644, to which was added £35,711 brought forward from the previous half year—giving a total of £66,355. After charging income-tax, interest on debenture stock, and the cost of the Company's new Special Act, &c., and writing off £2952 in respect of depreciation of securities representing the special purposes fund, a sum of £59,319 is available for dividends, which are recommended at the statutory rates. This appropriation will require £22,705, and leave a balance of £36,613 to be carried forward. The report is signed by Mr. Arthur M. Paddon, Chairman.

◆

Birmingham and its Elective Auditors' Comments.—The Elective Auditors to the Corporation of Birmingham (Messrs. Houghton and C. E. Smith) have prepared a report on their audit of the city's accounts for the past financial year. They state that the abuses which a financial critic discovers in the local administration are "not illegalities or improprieties against admitted principles, but practices openly sanctioned and justified." High salaries, excessive professional fees, extravagant compensation, heavy interest charges, are said to "make the ransom of a small kingdom." As to the Gas Department, they point out that large contracts are made for mains and services, the basis of which appears to be cost price, *plus* a percentage for profit and supervision. The figures are not subject to competition; and the only check the Committee have is the watchful eye of the Distributing Engineer. "The department may have had good value in such contracts; but the Auditors share the opinion of a member of the Committee—that the system itself is unsound, and lends itself to extravagance." Dealing with the Water Department, they remark that comment has been made before on the large amount of overtime paid for by this department. Extra work on alterations of water charges cost £105. Refreshment allowances, as well as overtime, are paid. The Auditors do not think any other department of the Corporation pays on this liberal scale.

Rochester Gas Company.

On Thursday week the half-yearly general meeting of the Rochester, Chatham, and Gillingham Gas Company was held—Alderman E. W. Willis, J.P., in the chair. In the course of the report submitted by the Directors it was stated that the completion of the new gasholder, vertical retort settings, and coal and coke handling plant, which has so long been delayed, owing to the scarcity of labour and the difficulty in obtaining materials, is now an accomplished fact. Already the plant has proved of very great service; and the Directors feel that not only will economies be effected, but it will now be possible for the Company to face the ever-increasing demand which is being made in their Gillingham district. Specially mentioning this matter, when moving the adoption of the report, the Chairman (after analyzing the figures of the accounts submitted) said that when the new works were in full operation it was hoped the Company would be able to scrap some of the old ones—some of the retort-houses were obsolete—and this would give them an opportunity to work at a much cheaper rate. A dividend at the rate of 5 per cent. per annum on the consolidated ordinary stock, less income-tax, was declared; and the usual votes of thanks to the Chairman and Directors, to the Auditors, and to the officials followed. Mr. Lewis Levy, in proposing the vote, paid a great tribute to the energy of the Chairman. They were much indebted, be considered, to all concerned for the labour put in and skill with which they managed the affairs of the Company. Mr. Elliott, in seconding, spoke of the good qualities of the Secretary and their Engineer (Mr. Day and Mr. Bennett), and gave the meeting the reminder that Mr. Day had been in the service of the Company for nearly half a century. Both Mr. Day and Mr. Bennett suitably replied—the latter remarking that, because of the extraordinary times through which they were passing, they realized that extraordinary care and extraordinary thought were needed.

◆

Curtailed Street Lighting made a Personal Grievance.—At last week's meeting of the Nuneaton Town Council, one of the members (Mr. J. H. Whitehouse) asked who had given the order for the curtailed lighting of the streets of the borough. He contended that the dark streets were a source of greater danger than any likely visit of airships and aeroplanes. The Mayor said he understood it was a matter entirely in the hands of the police. Mr. Whitehouse repeated his question, and added that unless the information was forthcoming, he should tender his resignation as a member of the Council. It was not right that one person should override the opinions of members who were sent there as the representatives of the people. The Mayor was surprised Mr. Whitehouse should make a little personal inconvenience the ground of such an outbreak at so critical a time. His (the Mayor's) opinion was that they ought not to have any lights at all. Coventry, a great munition centre, was not far distant from Nuneaton; and therefore it was highly probable Zeppelins might come. The incident then closed.

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A lighted taper, turn on the gas tap, and then
the air, and the furnace is working.

See "Journal" for May 25 and June 1 & 8 (pp. 471, 525, & 596).

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Grays and Tilbury Gas Company.

The half-yearly meeting of this Company was held at the London offices, No. 4, Eastcheap, on Monday of last week, when dividends at the rate of 8½ per cent. per annum on the "A" shares and of £5 19s. per cent. per annum on the "B" shares—both less income-tax—were declared. In the absence of the Chairman (Major F. E. Bartlett) on military duties, the Deputy-Chairman (Mr. Courtenay C. S. Fooks) proposed the adoption of the report and accounts. The revenue account showed a profit of £5282; and after providing for the fixed charges, there remained a balance to the credit of net revenue account of £6265, of which the dividends will absorb £3750—leaving £2534 to be carried forward. The Directors much regretted that, owing to the high cost of coal and other materials, they had been compelled to increase the price of gas. Mr. G. C. King and Mr. Worthington Church were re-elected Directors. A hearty vote of thanks to the Directors, Engineer, Secretary, and staff was passed and responded to by Mr. A. W. Sumner, the Engineer and Manager, and Mr. W. F. Whittaker, the Secretary.

◆

Gas v. Electricity for Workhouse Lighting.—In a discussion at the Navan Board of Guardians regarding the condition of the electric plant, the Clerk read the following figures showing the cost of gas and electric light, respectively, for the past three years: Gas—March 1913, £152 2s. 11d.; 1914, £49 14s. 7d.; 1915, £74 17s. 5d. Electric light—1913, £94 15s. 5d.; 1914, £149 8s. 4d.; 1915, £72 1s. 1d. Mr. Clusker thought they should instal gas and abandon the electric light, as they had no chance of getting a loan to enable them to deal with the electric plant; and if they went on as at present, they would be incurring further expense. The proper thing, in his opinion, would be to get gas until the war conditions were removed. Mr. Clusker said they had saved on gas in the past, and could do so again.

Bury St. Edmund's Gas Company.—Last Friday week the 132nd half-yearly meeting of the Company was held, under the chairmanship of Mr. T. Ridley. The six months revenue was £7842; the expenditure, £6054. The balance of £1788 added to the profit and loss account balance brought forward, £5312, and allowing for interest on the reserve fund invested, placed an amount of £7172 at the disposal of the shareholders. The Directors recommended, and it was agreed to pay, the usual dividend of 10s. per share on the 1849 capital, 7s. 6d. per share on the 1859 capital, and 7s. per share on the 1879 capital—all free of income-tax. The Chairman spoke of the increase of about £1100 in the sales of gas, as compared with a corresponding half of 1914. There had, however, been extra expenses. But on the whole there was a net balance of about £300 profit as compared with last year. Mr. H. R. Barker congratulated the shareholders on having improved their financial position, and welcomed the new Engineer and Manager, Mr. H. R. Wimhurst. The Chairman replied to a vote of thanks; and Mr. Wimhurst took the opportunity of expressing his pleasure at being associated with the Company.

Scraping a Water-Main at Liskeard.—At last Tuesday's meeting of the Liskeard Town Council an estimate was accepted for the scraping of the 8-inch water-main from St. Cleer reservoirs to Addington, at 8½d. per yard. The Borough Surveyor (Mr. T. M'Meikan), in a lengthy statement on the condition of the water undertaking, reminded the Council that the main was laid by the old Water Company about sixty years ago; and incrustation in it had been going on ever since. Fifteen years ago the Council purchased the water-works, and had been engaged in improving the supply by stopping leaks and in other ways; so that the supply to the town was increased by 25 to 30 per cent. Meanwhile an increased demand for water also arose by reason of new houses, for manufacturing purposes, and in other directions; and not only increased quantity but more pressure was required. After investigating over the past ten years various methods of cleaning mains, he was satisfied that the method now recommended would increase the volume of water by something exceeding 20,000 gallons per hour; so that, with reasonable care by consumers, and attention to leakages, the present demands might be met and existing complaints rectified. The cost of the work would be placed to the capital account, and would be a mere item if it tided over a further outlay on the mains for (say) twenty years.

Weymouth Consumers' Gas Company.—The Directors, in their report to be presented at the half-yearly meeting of the proprietors on Thursday, say that the demand for gas has never before been so high during the first half of a year as during January to June this year. The quantity sold was 76,031,100 cubic feet, or an increase of 9·74 per cent. upon the 69,277,700 cubic feet sold in the corresponding half of the year 1914. Coal cost nearly 50 per cent. more than it did twelve months ago. Some of the additional amount was caused by the larger tonnage of coal required to produce the increased quantity of gas sold; but the bulk of the addition was due to coal having to be bought outside the contract, owing to the difficulty of getting the contract coal conveyed, and to the abnormal rise in freight charges. About one-third of the additional cost of coal was "fortunately met by the better returns from residual products." When recently the question of entering into contracts for coal for the current year was before the Board, it was found that coal could only be bought at such high prices as would render it necessary, in the interest of the stockholders, for the price of gas to be raised. The Directors, therefore, gave notice that from June 30 the price would be increased from 3s. to 3s. 6d. per 1000 cubic feet to consumers using ordinary meters, and that the slot meters would be adjusted to make the increase in price to consumers using that type as nearly as possible the same. The Directors have depreciated the amount at which the Company's investments stand in the books by £1013. The balance at the credit of the net revenue account, after providing for interest upon the debenture stock and depreciation of investments, is £6007, out of which a dividend on the ordinary stock for the half year at the maximum rate of 5 per cent. per annum is recommended.

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Haverhill Gas Price Increased.—The Haverhill Urban District Council yesterday (Monday) week adopted the report of the Gas Committee, recommending that the price of gas, as and from the 30th prox., be increased from 2s. 10d. to 3s. 4d. per 1000 cubic feet.

Oundle Public Lighting.—At last week's meeting of the Oundle Urban District Council, the Gas Company's revised tender for lighting the public lamps, subject to not lighting three nights before and three nights after a full moon, as from the 15th inst. to May 1, 1916, was presented at £1 18s. per lamp. The question arose as to having all the lamps lit; it being stated that in many towns the lighting was being curtailed. Eventually the matter was left to the Highway Committee for consideration; but it was agreed that in the interim the all-night lamps be lighted until the matter is settled.

Romford Gas and Coke Company, Limited.—The half-yearly meeting was held on Saturday, when the Directors reported that the revenue profit for the six months was £3840. To this was added a small amount for interest on mains laid on undeveloped estates—making with the balance brought forward from the previous half year an available total of £7818. After providing for interest on debenture bonds, consumers' deposits, reserve fund, and insurance fund, there was a net balance of £7198. Out of this sum, the Directors recommended the payment of dividends at the rate of 13½ per cent. per annum on the original shares, and 10½ per cent. per annum on the "B" shares—both less income-tax. These amounted to £3094, leaving £4104 to be carried forward. The sale of gas, it was reported, showed an increase of 2·5 per cent. over the corresponding half year of 1914, "in spite of the restrictions on public lighting and large lamps outside business premises, imposed by the authorities in consequence of the war."

Bournemouth Gas and Water Company.—The ordinary general meeting (the 90th) of this Company will be held in London next Friday, when the Directors will report that the issues of capital referred to six months ago have been successfully completed; and the Board are now making an issue of £12,500 of 4 per cent. debenture stock, the proceeds of which will they anticipate suffice to complete the payment for the principal new works now in hand. The proprietors will be asked to sanction an issue of additional share capital to the amount of £25,000, and of further borrowing powers to the amount of £15,716. The results on the working during the past half year are considered to have been satisfactory. To meet the increased cost due to the rise in freights, coal, wages, and materials, the Directors felt compelled to raise the price of gas by 4d. per 1000 cubic feet from Ladyday last. The income from gas sales was increased thereby; and the sales of residuals were more profitable. Actual sale of gas, moreover, showed an increase of 9¾ per cent. After writing off £3500 for works superseded, the Directors recommend the payment of dividends (all less income-tax) varying from 6 to 15 per cent. per annum—which latter is the dividend on the original capital, determined by the price of gas. The dividends will amount to £20,150, and leave to be carried forward £23,876.

Leeds and its Water Supply.—The annual report of the Leeds Corporation water undertaking, just issued, shows that the amount expended on the works up to date has been £4,056,404. The net profit for the past year was £51,493; and after providing £49,804 for repayment of debt, there was a surplus profit of £1689 paid into the city fund towards the relief of the rates. The consumption of water last year was 5,728,699,000 gallons, an average of 15,695,000 gallons daily, which is a decrease of 153,000 gallons per day. The supply in bulk to other authorities was 156,144,000 gallons—an average of 427,792 gallons per day, as against 407,347 gallons the previous year. The daily average supply per head of the population was 32·19 gallons, as against 32·47 gallons the previous year.

Presentations to Officials.—At a recent meeting of the Dublin Corporation, a resolution moved by Alderman Quaid sought to express disapproval of the presentation of an address and gifts by the waterworks staff and other officials to Mr. M. A. Moynihan (the Engineer to the Water Committee and Deputy Borough Surveyor), on the ground that such presentations are open to the suggestion that employees feel constrained to subscribe. Further, the Corporation were asked to state their opinion that this particular presentation was "not consistent with the effective control of the Water Department." Mr. Sherlock submitted an amendment expressing confidence in Mr. Moynihan's capacity and probity, but deprecating the presentation of addresses to officials by their own men; and Mr. Quaid offered to withdraw his motion in favour of the amendment. The Lord Mayor (Mr. J. M. Gallagher) said Mr. Quaid's motion was "a most contemptible one." Mr. Daly moved "the previous question;" and this was agreed to by 46 votes to 9.

Worthing Gas Company.—The profit and loss account of this Company showed at June 30 last a balance of £23,809, of which £4384 was transferred from the revenue account as the difference between the receipts, £23,531, and the expenditure, £19,147, for the first six months of this year. The Directors report that the new gasholder will be in use next month. Various causes are said to have delayed the completion of this much-needed work; and now that it is accomplished it will conduce to the more efficient manufacture of gas and will enable the Board to arrange for a supply to the neighbouring parishes of Sompting and Goring. The necessary distributing mains are already laid to Sompting, and the work will shortly be undertaken in the case of Goring. Twenty employees of the Company have joined His Majesty's Forces, and four have enrolled themselves for the manufacture of munitions. The Directors mention that they could ill-spare their services; but with the cheerful co-operation of the present staff, work has been continued without serious inconvenience. In common with other gas companies, the Company have been compelled to meet the increased cost of coal and other materials by raising the price of gas, with the consequential result that the dividend must now be reduced to the standard rate of 5 per cent. per annum (less income-tax) upon the consolidated ordinary stock.

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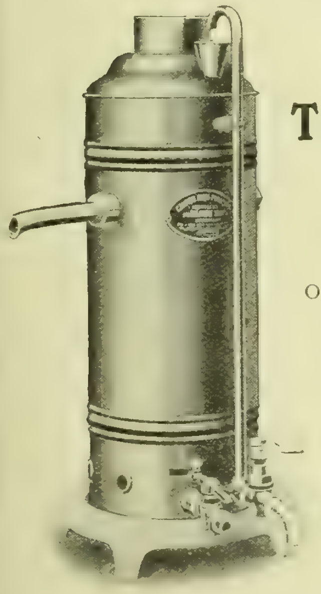

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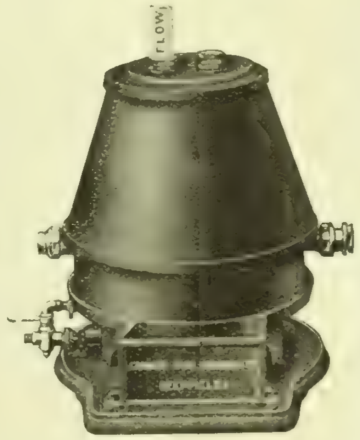

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Adjusting the Slot-Meter Prices at Normanton.—The half-yearly accounts of the Normanton Gas Company, submitted last week, showed that the undertaking, like most others, has been seriously affected by the war. To meet the extra cost of coal means an advance of 7d. per 1000 cubic feet to consumers; but this would necessitate expensive alteration of the slot meters. To avoid this, the increase decided upon was placed at 3d., and any deficiency will be made up out of the reserve of the Company. Last year the sales of gas had been 632,000 cubic feet less than in the previous one; the total income from all sources had decreased by £203; and the profits were £902 less.

Wellingborough Gas Company, Limited.—At yesterday's (Monday's) half-yearly meeting of this Company the Directors reported that the sale of gas during the six months to June was 9 per cent. more than for the first half of 1914. Contracts have been entered into for the supply of coal to the end of September of next year. The prices are "very seriously advanced;" but the Directors hope "by strict economy to avoid any increase in the price of gas." A new show-room was opened last January, and the results are said to have fully justified the step taken. The Directors recommended dividends of £6 12s. 6d. per cent. on the original shares and £5 2s. 6d. per cent. on the additional shares, less income-tax.

Chichester Gas Company.—The figures shown in the accounts of this Company, to be submitted at the half-yearly meeting of shareholders being held to-day (Tuesday), show that the business has been "adversely affected by the restriction of lighting imposed by the military authorities. The balance of the profit and loss account (after providing for interest on the debenture stock, temporary loans, &c.), amounts to £1846, out of which the Directors are recommending the declaration of a dividend for the half year to June 30, at the rate of 7 per cent. per annum upon the "A" capital, and £4 18s. per cent. per annum upon the "B" and "C" capital—all less income-tax. The Engineer (Mr. T. N. Ritson, Assoc.M.Inst.C.E.) reports that the works and mains are in a "thoroughly efficient condition."

Southport Gas and Electricity Joint Meter Readings.—This matter was again referred to at the last meeting of the Southport Town Council, on an item dealing with sundry wages in the minutes of the Gas Committee. Mr. Billington said some little time ago the Electricity Committee passed a resolution suggesting that the meters of the gas and electricity concerns should be read by one and the same person; and this was unanimously agreed to by a Sub-Committee of both Committees. He would now like to know whether the system of having two men had been stopped. The Mayor ruled that a question of policy could not be discussed at this stage; the item before the Council merely referring to the passing of accounts. Mr. Billington replied that he only wished to know whether the men had been stopped. He understood they had not.

Southgate District Gas Company.—Next Thursday the half-yearly meeting of this Company will be held at the London offices, Great Winchester Street, E.C., when dividends will be proposed of 5, 10, and 7 per cent. on the preference, original, and additional capital respectively. The sales of gas in the six months, January to June last, as compared with the corresponding half of 1914 showed an increase of 1,694,300 cubic feet, or 1·5 per cent.; and the revenue from residual products an increase of £295. After providing for interest charges, &c., there remains a balance of profit of £5324. The appropriation for dividends at the rates named will require £4219, and leave a balance of £1105 to be carried forward. The Directors report that the great increase that has taken place in the price of coal and other materials, and the payment of war bonuses to employees and maintenance allowances to dependants of the Company's workmen serving with the Forces has imposed a very serious burden indeed upon the Company's finances—the net deficit in the profits of the half year being no less than £1977. The price of gas was increased as from Midsummer from 3s. 2d. to 3s. 8d. per 1000 cubic feet. During last half year £2500 of "additional" ordinary stock and £5000 of 5 per cent. preference stock were issued; the proceeds, £8125, being credited to capital.

GAS COMPANIES IN THE STOCK EXCHANGE.

Business on the Stock Exchange was quieter than ever last week, and again the House was closed on Saturday without any danger of impairing the activities of the markets. It must, however, in regard to this fact be borne in mind that it is not solely attributable to the abnormal conditions resulting from the war, but there is the normal quietude of the mid-August slack season that has to be taken into consideration. Movements were irregular, and the tone was variable. In the earlier part of the week there was some animation and an approach to activity, with a cheerful tendency. The War Loan was rather easier; but more or less recovery was apparent in Home Rails, American and Canadian lines, industrial undertakings of the Dominion, and South Africans. Some Russian concerns attracted favourable notice. But, with the turn of mid-week, some reaction set in, and the best prices were not maintained. At the close, Americans were affected by the loss of the White Star liner "Arabic." A serious bearing-down factor was the American exchange, the steady and continuous fall of which occasioned much anxiety. A recovery in some measure was effected on Wednesday, by the light of a promise that the matter would be taken in hand by the Government; and the co-operation of the banks was manifested on Thursday by a resolution of the Clearing Bankers' Committee to send representatives to New York to consider and deal with the positions. Business in the Gas Market continued on the same light scale as the week before, the prices of which were well maintained. Further meetings of prominent undertakings have been held during the week, and the directors had the satisfaction of receiving the assurance of the proprietors' sympathetic support in the anxieties they had gone, and are going, through. The Money Market was still easy for short loans, and discount rates, after some firmness, relaxed a little.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 78¾, 79, 79¼, 79½, ditto maximum 60, ditto preference 70¾, South African 9, 9⅛, South Metropolitan 80, South Suburban debenture 96½, 97. On Tuesday, Alliance and Dublin 59⅜, Gas Light ordinary 78½, 79, ditto maximum 59, Imperial Continental 55½, South Suburban debenture 96¾, 97. On Wednesday, Bournemouth debenture 74½, Gas Light ordinary 78¾, 79⅜, ditto maximum 59½. On Thursday, Commercial 4 per cent. 85, Gas Light ordinary 79½, ditto maximum 60, ditto preference 72½, South Metropolitan 80, 81, South Suburban debenture 97. On Friday, Gas Light ordinary 78½, 79, ditto maximum 59¼, 59¾, Oriental 100, South Metropolitan 82.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING AUG. 21.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	59⅜
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7½	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	..
50,000	10	Feb. 26	16	Bournemouth Gas and Water 10 p.c. . .	29—30	5 6 8	..
873,480	10	,,	7	B 7 p.c. .	15—15½	4 10 4	..
95,000	10	,,	6	Pref. 6 p.c.	13½—14	4 5 9	..
—	—	—	—	Deb. . .	..	—	74½
380,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
330,000	,,	,,	11	Do. New . . .	204—209	5 5 3	..
50,000	,,	,,	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	91—93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	,,	,,	8	Do. A Ord. Stk. .	154—159	5 0 8	..
530,000	20	Mar. 26	12½	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	Do. 4½ p.c. Pref. .	4—6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	85*
560,000	,,	,,	5⅓	Do. 3½ p.c. do. .	103—105	5 1 6	..
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	..
800 000	Stk.	,,	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	,,	,,	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	Derby Con. Stk. . . .	123—125	4 16 0	119½*
55,000	,,	—	4	Do. Deb. Stk. .	102—104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd. . . .	17½—18	5 11 1	..
16,364,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke 4 p.c. Ord. . .	98—102	4 15 6	78½—79½*
2,600,000	,,	,,	3½	3½ p.c. max. .	76—79	4 8 7	59—60*
4,062,235	,,	,,	4	4 p.c. Con. Pref.	96—99	4 0 10	70¾—72½*
4,674,850	,,	June 11	3	3 p.c. Con. Deb.	72½—74½	4 0 6	..
130,000	,,	,,	10	10 p.c. Bonds .	..	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16¼—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c. . . .	..	—	..
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C . . .	151—154	5 2 4	..
65,780	,,	,,	6⅜†	Do. B	115—118	5 8 0	..
65,500	,,	June 26	4	Do. 4 p.c. Deb. . .	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental .	150—160	5 12 6	55½
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c. .	119—121	5 7 5	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. A	211—213	4 13 11	..
718,100	,,	,,	7	B	146—14	4 14 7	
306,083	,,	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	—

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd. . .	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	98½—99½	4 10 6	
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	..
300,000	Stk.	May 14	8	Oriental, Ltd. . . .	117—122	6 11 2	100
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .	7¼—7¾	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B . .	128—131	4 19 3	..
100,000	50	,,	12	Do. C . .	118—121	4 19 2	..
52,000	50	,,	10	Do. D . .	..	—	..
249,980	5	April 29	8	Primitiva Ord. . . .	5½—6	6 13 4	..
499,960	5	June 26	5	,, 5 p.c. Pref. .	4¾—5	5 0 0	..
521,600	100	June 2	4	,, 4 p.c. Deb. .	91—93	4 6 0	..
—	—	—	—	,, ,, ,, 1911	..	—	..
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 3	..
209,984	,,	,,	10	Do. B	222—224	4 9 3	..
523,500	,,	,,	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African . . .	10½—11½	7 16 6	9—9⅛
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	80—82*
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	..
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	..
60,000	,,	,,	5	Do. 5 p.c. Pref. .	110—112	4 9 3	..
—	—	—	—	Do. West Kent. .	..	—	..
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	96½—97
629,740	Stk.	May 14	5	Southampton Ord. . .	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c. .	135—138	5 8 8	..
742,275	,,	,,	6†	B 3½ p.c. .	115—117	5 2 7	..
181,255	,,	June 26	4	4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	,,	,,	6⅞	,, B 3½ p.c.	129—134	5 2 7	..
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110—115	5 2 0	..
352,000	,,	,,	6⅛	Wimbledon 5 p.c. .	117—122	5 0 5	..
98,000	,,	,,	6⅝	Epsom 5 p.c. . . .	121—126	5 5 2	..
88,416	,,	June 26	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

* Ex Div.

Wrexham Water Company.—The report presented at the annual meeting of the Company stated that the expenditure on capital account during the year ended June 30, which amounted to £6261, had been chiefly incurred in connection with the provision of pipes for an additional trunk main. In the twelve months water had been laid on to 171 houses, making a total of 7776 houses now supplied. Out of the balance available, the Directors recommended the payment for the half year of the preference dividend free of income-tax, and also dividends at the rate of 7 per cent. per annum upon the consolidated stock, and £4 18s. per cent. per annum upon the ordinary stock, less income-tax. The report was adopted, on the proposition of the Chairman (Mr. H. Croom-Johnson); and subsequently an extraordinary meeting was held, when the Directors were empowered to raise further capital, to provide for the debit balance on capital account.

Income-Tax Free Dividends at Hailsham.—Against the advice of the Directors, the shareholders in the Hailsham Water Company determined that the dividends should be paid tax tree. In proposing the adoption of the report, the Chairman (Mr. A. Burtenshaw) said that heretofore the Directors had recommended a dividend free of income-tax; but if they were to keep the rate to the previous level of 5 per cent. they would be obliged in future to deduct the income-tax. No one could have seen that the income-tax was going to jump in the way it had; and it was only right that it should be brought to the notice of the shareholders that it would be impossible to pay the dividend free of income-tax. If this was done the dividend would probably be 4½ instead of 5 per cent. After the report had been adopted, a shareholder proposed the dividend named in the report—5 per cent.—free of income-tax; and this was duly seconded and carried.

Malton Gas Company.—The half-yearly meeting of the Company was held on Friday week, Mr. H. W. Pearson presiding. The Chairman said the position of the Company was shortly that, by economy, they were able to pay their usual dividend, after taking only the sum of £105 from their floating balance. They had already increased the price of gas 3d. per 1000 cubic feet; and the consumers must expect at least another advance of the same amount, which would bring the price to 3s. The real reason was the enormous increase they had to pay on their coal contract, which was practically 30 per cent. higher than last year. It was the only time in his life that he had ever inclined to the idea that the nationalization of mines would be for the benefit of the country. He congratulated the Secretary and Manager (Mr. Henry Tobey) on his recovery from a serious illness. Mr. Tobey intimated he had just completed forty years with the Company.

West Surrey Water Company.—At the half-yearly meeting of the Company on the 10th inst. (Mr. A. T. Simpson presiding), maximum dividends at the rate of 7 per cent. per annum were declared upon the ordinary £10 shares issued under the Acts of 1877, 1888, and 1901; and a maximum dividend at the rate of 10 per cent. per annum was declared upon the ordinary £10 shares of the Company issued under the Act of 1869, leaving a balance of £2845 to be carried forward. The report for the six months to June 30 stated that the income, after making provision for empty houses, irrecoverable rates, &c., amounted to £9477, and the expenditure to £4027. Comparing the accounts with the corresponding half of 1914, the income showed an increase of £462; and the expenditure was greater by £438—principally on account of the high cost of fuel, extra rates and taxes, &c. The additional supplies connected during the half year represent an increased future rental of £161 per annum.

Sanction Refused to a Water Scheme at Carlisle.—At last week's meeting of the Carlisle Rural District Council, a letter was read from the Local Government Board declining sanction for the Council to borrow £64,250 for their projected water scheme. The Board said the scheme was not a pressing necessity, either for reasons of public health or on account of war requirements. The Carlisle City Council had, it was added, expressed their willingness to supply the rural district with water in bulk at a price to be fixed by the Local Government Board, or by an arbitrator appointed by them. The Water Scheme Committee of the Rural Council recommended that a Sub-Committee be appointed to approach the Carlisle Corporation, to ascertain to what extent, and on what terms, they were prepared to extend their supply into the rural district, and the lowest price at which they would sell water for a supply to the districts to which they were not prepared to extend their mains. The recommendation was adopted.

A Military Threat at Bridlington.—At a meeting of the Bridlington Town Council last week, the Mayor said he had received a letter from the military authorities to the effect that the lighting of Bridlington was still too bright, and threatening to cut off the gas and electric light at the mains before dusk if forthwith there was not an improvement effected. Further measures, therefore, are now being taken to reduce public and private lighting.

War Work and Gas Output.—In the course of an article on the "Effect of the War on the Output of Gas for Manufacturing Purposes," the statement is made by "C. M. W.," in the "Birmingham Gas Department Magazine," that in the city during the past nine months upwards of £15,000 worth of gas-furnace plant and heating apparatus has been installed in the premises of various manufacturers who are practically all employed directly on Government work—this representing an increased gas consumption amounting to upwards of 300 million cubic feet per annum. In connection with the melting of brass, gun-metal, and aluminium for Admiralty and War Office work, high-pressure gas is being extensively used, both for the production of the many thousands of castings daily required and for the production of strip metal for rolling into sheet.

The Hindley (Lancs.) Gas Committee have decided to increase the price of gas from 2s. 11d. to 3s. 4d. per 1000 cubic feet. The decision has been approved by the District Council.

The Provincial Incandescent Fittings Company ("Pifco"), of Manchester, send a copy of their new catalogue, for the present lighting season of 1915-16, containing full illustrated particulars of their specialities in the way of incandescent gas mantles, lamps, burners, globes, and chimneys.

Mr. Reuben B. Gledhill, of Adwalton (Yorks), has been appointed clerk of works and carbonizing foreman at the Basford (Nottingham) Gas-Works. Mr. Gledhill has for the past four years been draughtsman and retort foreman at the Pontypridd Gas-Works, South Wales.

"Richmond's Silent Gas-Fires" are illustrated and explained in a booklet, for the season 1915-16, which has just been issued by the Richmond Gas Stove and Meter Company, Limited. Special attention is directed to the "Period" series, the varied patterns of which, as the excellent photographic reproductions show, enable fires to be selected suitable for any scheme of decoration.

The campaign promoted by the Munitions Parliamentary Committee has been very successful in the Birmingham district, where Mr. George R. Thorne, M.P. for East Wolverhampton, and Mr. A. Shirley Benn, M.P., have addressed several meetings of employees engaged on munitions work. Among the places visited were the works of the Sutherland Meter Company, at Witton, when a meeting was held under the chairmanship of Mr. A. Cecil Wright. Subsequently, upon the proposition of Mr. Wright, seconded by Mr. A. C. Frost (the General Manager), a vote of thanks was accorded the speakers.

APPLICATIONS FOR LETTERS PATENT.

11,478.—Wardle, W. W., "Mantles for incandescent gas-burners." Aug. 9.

11,481.—Macnicol, A. N., "Obtaining oils, spirits, and gases from organic or other materials." Aug. 9.

11,485-6.—Thorssell, C. T., "Production of ammonia." Aug. 9.

11,502.—Soc. du Gaz de Paris, "Gas heating." Aug. 9.

11,543.—Chorlton, A. E. L., "Internal combustion engines," Aug. 10.

11,636.—Phillips, S., "Production of gas from coal." Aug. 12.

11,678.—Brougham, A. R., "Internal combustion engines." Aug. 12.

11,761.—Parkinson Stove Company, Limited, and Cheshire, W., "Securing gas-fire radiants." Aug. 14.

11,779.—Morison, D. B., "Apparatus for use in combination with water-meters." Aug. 14.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Chemist (Coke Ovens). Walkmill Colliery, Moresby.
Foreman (Purification). Croydon Gas Company.
Working Foreman. Midhurst Gas Company.
Main and Service Layer. Todmorden Gas-Works.
Exhauster Attendant. No. 6080.
Lid and Pipe Attendant. No. 6080.
Stokers. Gravesend and Milton Gas Company.

Appointment Wanted.

Gas Engineer, &c. No. 6079.

Meeting.

Harrow and Stanmore Gas Company. Holborn Restaurant. Sept. 6. One o'clock.

TENDERS FOR

Coal.

Liverpool Gas Company. Tenders by Sept. 1.

Tar and Liquor.

Ashborne Gas Department. Tenders by Sept. 1.
Barnoldswick Urban District Council. Tenders by Aug. 31.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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Manager and Secretary.

JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXXI., No. 2729.] TUESDAY, AUGUST 31, 1915. [67TH YEAR.

EDITORIAL NOTES.

Fair Residuals Clauses this Session.

IN the long drawn-out controversy over the residuals restrictions, the contention of the gas industry was simply and solely that there should be freedom of trading in respect of their secondary products—a freedom of trading equal to that enjoyed by chemical manufacturers, by coke-oven owners, and by others. Though Parliament at first listened to the plea of the chemical manufacturers, that the gas industry should be shackled while they should be allowed full liberty, the Joint Committee of both Houses of Parliament who were deputed to consider the matter reported entirely in favour of the attitude and claims of the gas industry. This should have finally disposed of the issue. On the contrary, however, in the session of 1914, the restriction of the power to purchase to the equivalent of one-third of the residuals production of the purchasing gas undertaking was imposed upon the South Suburban and Swansea Companies; and then, when the "Model Clauses" were published, in preparation for the present session, it was found that the new clause referring to gas-works residuals still contained the one-third limitation.

Against this infringement of the liberties of the gas industry, and the violation of the report and recommendations of the Joint Committee, protest was made in our leading columns on Nov. 10 last, and the promoters of Bills in the then approaching session were strongly advised to again ask for, and defend, the principle of freedom to the full extent. So keenly in the industry was the injustice felt, that there was quickly talk of taking more drastic action by large concerns more freely entering upon the manufacture of sulphuric acid and the work of tar distillation, and the proprietors of gas undertakings forming distinct district companies with separate capitals for dealing in and developing the residuals of gas manufacture. Nothing but the unfair action of the chemical manufacturers would have led to these suggestions, which, if carried out, would be infinitely worse for them than maintaining the freedom of residuals trading that the gas industry desired, in order to realize the best possible market prices to the advantage of its undertakings and their consumers. The restriction to one-third of the home production might not be a particularly harmful one for some gas undertakings, but it might be for others. The objectionable aspect of it is the recognition that it made—not by the Joint Committee of the two Houses of Parliament who were instructed to adjudicate upon the matter, but by one or two Select Committees not specially appointed to inquire into it—of the principle of limitation; and against this the industry was dead-set. In this recognition of limitation, there was a potential danger.

Then came the difficulty in which the country found itself in the matter of explosives for the war, and the ingredients for their production—toluol, carbolic acid, sulphuric acid, and so forth—and, while feeling a little sympathy for those in parliamentary authority who had, at the instance of the pocket-interested chemical manufacturers, meddled with the gas industry, we felt bound to point out to them, in the "JOURNAL" for Feb. 16 (p. 370), that had it not been for the gas industry, and its ability by certain developments in its residual processes, to increase the production of the ingredients for explosives of which the country was in dire need, the country would have been in an awkward position—both in the present and in the future.

It is hoped the lesson has been taken well to heart. There are signs—assuming we read them correctly—that it has. Among the statutory gas company Bills introduced for the current session, there were three that dealt with the question of residual products, and not one of them adopted the model residuals clause with its unjust restriction; but the promoters asked, and were prepared to fight again, for the principle of freedom for which the industry intended to contest time and again. The three Bills were those of the Ormskirk, Prescot, and Warwick Companies. In the Ormskirk Bill, the Company sought to be put in the position of free traders in residuals, by the adoption of the old form of clause permitting them to "convert and manufacture, purchase, deal "in, and sell residual products resulting from the manu"facture of gas." The Warwick Company also asked for the right to "purchase, manufacture, convert, supply, sell, "and deal in all residual products resulting from the manu"facture of gas." The Prescot Company merely desired open powers to "convert and manufacture residual products "resulting from the manufacture of gas." What has happened is that the new model clause has been inserted in the three measures, *minus* the provision as to the restriction of purchasing rights to the equivalent of one-third of the home production. Without the proviso, the model residuals clause, as it now stands in the three Acts, gives the gas industry all it wishes. It wants the right as allowed in these Acts, (*a*) to work up and convert the residual products arising directly or indirectly from the manufacture of gas by them; (*b*) to purchase the residual products arising from the manufacture of gas by other gas undertakings, and therewith manufacture other products of the same kind as the company are manufacturing from their own residual products; and (*c*) to purchase from other gas undertakers and elsewhere, and use, the materials required to work up and convert the residual products so arising from their own manufacture of gas or purchased as aforesaid. The gas industry has no objection whatever to the prohibition that a gas undertaking shall not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings, or in the manufacture of which the use of residual products produced by the company or purchased from other gas undertakings is merely subsidiary. As we have said, the clause as it is in the Ormskirk, Prescot, and Warwick Acts, shorn of the "one-third" restriction, gives all the industry desires for its own protection. It is hoped that, as the clause appears in the three Acts named, so it will be generally granted without any further contention. If this proves so, we have arrived at the end of a very unpleasant piece of business.

Consumers as Capital Providers.

As we were recently pointing out, sufficient has not yet been done in tapping the man with a capacity for small savings for helping in the capitalization of industrial enterprises in this country—especially industrial enterprises carried on under the protection of special parliamentary powers. Some gas undertakings many years since recognized that here was a potential source of capital, and have since proved the correctness of their faith. But other gas undertakings have passed by the "small" man, and have made no special appeal to him, preferring to keep to the old ways of selling by public auction or tender, and maintaining their stockholding register as compact as possible, instead of extending the number of holding units towards the lower scale in amount. They make a huge mistake. An enormous part of the gas industry's business is now constituted of the patronage of consumers on the small scale; and every opportunity should be specially given to these, as well as to ordinary consumers, to make the local gas company the place in which profitably to invest their savings. For business reasons, the more the co-operative character of gas undertakings is developed, and the greater the financial interest of the consumers in a gas undertaking, the better. Such an interest is a source of trading strength. The Government only recently recognized the power of the people who save as providers of capital by inviting them to subscribe to the War Loan in small amounts; and there has been a healthy response—the small investor realizing that he is getting a better return on his savings in this way than he can do through any of the ordinary channels for accumulating small amounts of savings, except in ordinary times a well-established gas company. The South Metropolitan Gas Company have found the consumer a useful provider of capital. They have lately, with the sanction of the Treasury, been offering stock to the amount of £100,000 to their consumers and employees; but prior to this the consumers had invested £1,430,000 in the Company, in consequence of invitations to subscribe for stock. We repeat that the gas consumer as a source of capital provision should not be ignored. As things are seen at the present time, we fancy the companies who have not tapped this source before will in future have to look upon it with greater favour, and not neglect it.

Although in the British gas industry, issue of stock to consumers and employees has been long practised by several undertakings, the "Electrical Times" goes to America for illustration of this method of raising capital; the opportunity being the issue of stock to consumers and employees by the Pacific Gas and Electric Company, and two other large concerns. By staying at home, our electrical contemporary might have obtained antecedent illustrations. As a matter of fact, some of the American gas and electricity undertakings have done the British gas industry the honour of extracting several notable items out of its policy and methods of procedure. The British gas industry gave birth —Sir George Livesey being the originator—to the sliding-scale system of price and dividend as applying to a *quasi*-public service; and its author also perfected it by—away back in the Eighties—bringing in the employees as co-partners. And long ago, he was practising the method of issuing stock in small sums to consumers and employees. We are pleased to see the Pacific Coast Gas and Electric Company have done so well over the issue of capital to their consumers. Our contemporary says the Company wanted capital for extensions; and they were advised by the supervising authorities to create a new issue of first preference stock. "Up to the end of last May, they had sold on "an average 17·47 shares to each consumer, 3·37 shares to "each employee, and a still larger quantity to 'consumers "'and others.'" The "consumers and others" took up no less than £717,000 worth of the stock. This is an excellent result. Our contemporary commends to electricity undertakings the scheme of profit-sharing as a possible compromise in the movement of labour for a larger share of benefits in a business, and the issue of stock to consumers as a means of promoting closer relations between householders and the electrical department. Unfortunately, for the success of such a scheme in the British electricity supply industry, the greater number of the undertakings are under municipal management, in which there are not the necessary fundamentals to success. We do not think that the interest that local governing bodies are desirous of paying for their loans is of a sufficiently weighty character to attract the small investing consumer. Nor does the system of municipal ownership lend itself to the giving of employees a stock-holding interest in the concern as through the co-partnership scheme of the gas industry. There are profit-sharing or bonus schemes in connection with municipal electricity concerns; but they are profit-sharing schemes and nothing more, with evanescent effects compared to the permanent effects arising from co-partnership.

Gas Workers and Munitions Work.

The large and still increasing range of mechanical operation in gas-works has brought into being in most of them fitting-shops well-equipped with machine tools for the carrying out of repairs, reproducing parts for renewals, and for realizing economy in some of the constructional work. These were the peaceful purposes for which the fitting-shops were planned; and it is safe to say that it never crossed the mind of anyone that many of the shops would ultimately be devoted to the production of parts of such instruments of destruction as shells and bombs. But it is so to-day; and the gas industry is pleased to be of national service in this way, as well as in others. It has not been—the industry has before proved its adaptability to varying circumstances—at all a difficult thing to turn the shops from the one purpose to the other; and the mechanics of the industry (those who have not been able to go to the front) have been pleased to have this chance of applying their skill in the country's cause. Even were they all physically fit and of military age, such a public service as gas supply could not let the whole of them go. The numbers have been so reduced now in most works that more mechanics could not be spared full time to go into munitions factories. But there are these fitting-shops on the gas-works themselves. Their help is wanted by, and is valuable to, the country; and the gas-works mechanics can in them put in variously a number of hours a day in producing munitions, and so working directly for the country. This assists materially to mitigate the feeling that they are not doing all that their skill would enable them to do in the country's cause could they give full time to the work. Work of the kind—if the Munitions Department accepts the services of a gas undertaking—is something to be encouraged, as there is no doubt that it does help to keep the men well together. The matter was one to which the Chairman of the Bournemouth Gas and Water Company (Mr. G. Crispe Whiteley) and the Acting Engineer and General Manager (Mr. P. G. G. Moon) made special reference at the meeting of the proprietors last Friday.

Gas as an Aid to Industrial Economy.

The country has been lately bombarded with economic principles, and with much of a theoretical and abstract character bearing on the subject; but there has been little attempt to focus all this by practical illustration. In an article in "World's Work," Mr. James Armstrong gives practical treatment to the subject in relation to industry. We do not know the author; but whoever he is, he does a service to industry generally, including that engaged in the supply of gas.

There is no question but that the war has roused many somnolent British manufacturers to the need for departure from the old ways, and entry upon, and perseverance along, new ways. But there is still much work to be done to raise the country to the highest possible state of industrial efficiency. Until the War Office gave many of our manufacturers work to do that they had not touched before, there were those among them who had never attempted to turn out more than one class of goods, and that class produced by traditional stereotyped methods. The idea had not struck them that their ground area, their plant, their men, themselves could all possibly be improved and made more productive. But the war has marvellously expanded ideas; and things are now being seen through new glasses. And not a bit too soon. Germany had made war on our industries, had detected the most vulnerable place in them, and that place formed by the contentedness of manufacturers to preserve things as they were, and without any aspiration to effect progress by developing new ways and gaining new knowledge. Germany found the road to an ascendancy, in many directions, over British manufacturers by doing what the latter declined or neglected to do. Fortunately, the eyes of many British manufacturers are now open to these things; and there is no doubt that, in the history of the progress of British industrial economy, Germany will stand as the British manufacturers' greatest incentive to change, and to the breaking-down among them of conservatism and prejudice. We may, at all events, give Germany its due in this regard.

To return to Mr. Armstrong's article. He heads it "Town "Gas: The Money Maker." The title should appeal to the manufacturer. Money-making is his objective; and the nation only lives and prospers through it. The extent of money-making in industry is largely controlled by the factor of economy. If one manufacturer, by the adoption of economical methods, can produce at a cheaper rate than a manufacturer who clings tenaciously to established customs, the latter, with less economical production, must cut down the profit on his goods in order to compete with the former, who is enabled to sell at the lower price and still maintain his profit solely through reducing cost by having recourse to new processes. This is a point made by Mr. Armstrong; and it is precisely the line of action that Germany was taking, to its industrial and therefore national benefit, in competing with us. By new processes, the German manufacturers were cutting down the cost of production; and by new processes they were extending the range of goods put on to the world's markets—our own included. That is one reason why the British manufacturer must search for and adopt more economical processes, and relieve himself of the shackles of long custom. Another is that, in these days of stress, the prices of commodities required by manufacturers are soaring to unprecedented heights. The higher the costs, the higher the selling price; and the cute manufacturer knows that in many productions the higher the price, the more restricted becomes the market. It is his business to counteract the rising tendency of material as far as possible.

The two worst enemies of the British manufacturer (there is not much of which complaint can be made in connection with the gas industry nowadays, though the past has its illustrations of backwardness) have been, Mr. Armstrong points out, conservatism and prejudice; and he still looks upon them as formidable. They are. But they will not henceforth stand the hard knocks that will be administered by the progressive application of economical practices by competitors, both at home and abroad. We believe that more will be done in the destruction of these two old enemies by the force of rival enterprise, and the demonstration of success following the application of economical processes, than by any other means. This is already being seen in connection with the economy offered by gas in the factory. This is Mr. Armstrong's illustration; and by it he shows how gas is a money-saver. The steam-raising plant and the steam-engine (not including the turbine for large power work), with their space requirement, and all their attendant losses, are surviving children of tradition. Conservatism and prejudice have maintained them in their places so long; yet the gas-engine occupies less space, is always ready, saves time, and has no stand-by losses. There we have one direction for money-making through economy. But the use of gas for heating in industrial operations is the major illustration in the article in "World's Work." It is a strong and eye-arresting assertion that "the advantages derived from the "use of gaseous fuel may mean the difference between "profit and loss in production." Strong as it is, there are no doubt cases in which it is quite true; there are cases in which it will become more true as the over-all economy of gaseous heating is brought to bear upon the competition between manufacturers.

Incidentally, Mr. Armstrong shows in his article the folly of manufacturers taking only fuel costs for comparison and decision. He gives an illustration—a case in which 8 million cubic feet of gas a year are used now—where, in comparison with coal, gas-furnaces effected a saving of £269 in one year in the fuel bill. But this was not by any means the sum of works economy yielded by gas operation. By the introduction of gas-fired furnaces, two thirds of the floor space was released. "In other words, "it was quite possible to treble the existing output of the "works, if desired, by installing further plant"—thus enlarging the factory output without the erection of any additional buildings. This means a large saving in capital and other charges, combined with the saving (in the example) by being able to dispense with the service of a stoker, and by the old supervising staff being better capable of performing their functions than they would be by having to cover a more extensive ground area. About the economy produced by being able to regulate temperatures as desired—so securing not only improved, but more regularity in, quality—and about the cleaner and healthier factory conditions, we need not say anything here. They all go into the balance in reducing cost of output; and they all show how town gas can be made in industry a more prolific producer of profit by raising the standard of economical working. It is true the price of gas has risen. So has the price of other fuels, and to a greater extent. Moreover, the variations of the price of gas are not of the capricious order that obtains with other fuels. In the "world's work," it is a very safe prophecy, gas is going to take a greater place than ever.

Meanness in South Wales.

When the whole country had thought that peace had been restored in the South Wales coalfield, and that, at any rate during the war and for some time after, there would be no further difficulty, it is again thrown, through discord in the same quarter, into gloomy suspense. The agreement between owners and miners which it was believed would have been signed to-day is not signed; and there are over 10,400 —that was the number reported at the end of last week—miners on strike, and threats of more malcontents coming out. Whatever the cause of the discontent, these men are acting treacherously against the country when every man's actions should be set resolutely to the one object of making the defeat of the enemy as quick and certain as it can be. When men act as the South Wales miners have done, and are doing, at such a time as the present, it shows that high principles and honour have no real existence with them. Self-interest alone moves them; for it is admitted that they earn good wages, and have really nothing to complain about in this regard. After what has happened, it seems almost impossible to further rely on their word. When the settlement was arrived at in July, and reference was made to the President of the Board of Trade to determine as to the terms of the new agreement, it was resolved between the Monmouthshire and South Wales Coal Owners' Association and the South Wales Coal Miners' Federation that Mr. Runciman's decision should be final and binding. But within twenty-four hours of the issue of his award, there were miners who had left their work, totally callous as to the result of their action upon the country in the terrible struggle in which it is engaged. Men who are capable of such action are not worthy the name of Britishers.

Whatever the cause of the dispute, there is no excuse for the men's action. The award was to be "final and binding." Yet the men refuse to accept it; and, through the power of numbers and the condition of the country sorely needing the results of their labour in and about the pits, they have compelled a reopening of certain questions, which could have been reconsidered without such drastic method of compulsion as that to which they have resorted. Only two material points have been raised by the men; and, in regard to the main one, it is a question for determination as to what was the understanding at the time of the settlement which returned the men to work in July. The men contend that the award itself transgresses the understanding. If it does, it is only right that there should be adjustment. But the whole tenor of the award is against the men on the point in dispute. Mr. Runciman dealt with the questions submitted to him in the abnormal conditions of the times, and held that his decisions were not to be taken as precedents affecting normal times. This being so, the new agreement to be effected under the award is only to continue during, and for six months after, the war; and its termination is then to be subject to three months' notice from either side. On the greater number of points—these the minor ones—the award is opposed to the men's requirements. But it is averred on their behalf that they accept these, but not the alleged violation of the understanding arrived at in July. In lieu of the standard of wages prevailing prior to July 15, Mr. Runciman has decided that a new standard shall be established by putting 50 per cent. on the 1879 standard; and, with 10 per cent. added thereto, the result is to operate as the minimum wage. But there is to be no standard rate of less than 5s. a day. This applies to underground workers; and surface workers are also to have the same minimum. Of course, this minimum is not the actual; one authority putting the average wages of the South Wales miners at from 6s. to 8s. a day. From the wages point of view, therefore, there is no excuse for the drastic action of the men.

This brings us to the gravamen of the dispute—the alleged point of provocation. As mentioned, Mr. Runciman's award is based on the extraordinary conditions of the time, and is confined to the duration of these conditions. Through this limitation, he appears to have fallen between two stools. He decided in favour of the contention of the coalowners that, under the conditions of the settlement in July, there should be no changes in the terms of employment or in the ordinary machinery under which the parties usually conduct their affairs, other than such changes as might be due to these terms, or were consequential thereupon. Mr. Runciman's decision excludes all enginemen, stokers, and craftsmen from the rule as to five turns being counted as six for afternoon and night shifts, which is the men's main grievance—they averring that, under the agreement of July, all classes of workers were to be included in the bonus turn, although on the mechanical side the workers have for years been outside the scope of general wages agreements. There is no reason why there should be any disturbance of this custom now; but if there was an understanding in July that these men should be included, then the understanding ought to be honourably complied with. The men also desire the agreement to be retrospective—dating from July 20 last.

The above are the two causes of the present dispute—the former being the more important in the eyes of the men. But when the whole of the circumstances are taken into account, it is impossible to find a single palliating circumstance in favour of the action of the men. There must be something inherently wrong about men who accept arbitration as a means of adjusting differences, and then reject the findings, after binding themselves to accept them as final. If, in the decision, a condition of the arbitration is assailed or neglected, there should be some more peaceful means of setting the matter right than the one adopted by the men in this instance, which jeopardizes national interests in a great crisis. We hope a lasting settlement will soon be reached; and the quicker the better. There is no reason why it should not happen even before this article is published.

The Distribution of Radiant Heat.

Recently a reference appeared in the "Journal" to the opposing conditions that exist between the situation of a fire place in a room and the uniform and effective distribution of radiant heat. A source of heat located at one side of a room, and one from which the radiant heat energy proceeds from a straight, or slightly bow-shaped, face of incandescent fuel, cannot possibly perform its functions with the best results. The field of radiant heat distribution is limited. To get ideal results, the field of distribution should be the area defined by the walls of the room. The remarks formerly made on the subject [see July 27, p. 177] were prompted by the production of a new circular gas-fire. At the time, we were not aware that the Richmond Gas Stove and Meter Company were at work on, and had arrived near the point of production of, a fire with radiants placed in a semi-circle, so that the radiating energy makes lateral, as well as frontal, attack upon the solid bodies in, and walls of, the room. The development of the fire has been completed; and we are in a position to describe and illustrate it in this week's issue. In addition to enlarging the field of radiant heat distribution, it will be seen that the construction of the new fire promotes a higher radiant heat efficiency, as well as increases the ventilation of the room in which it is used. The descriptive article and illustrations may be left to speak further for themselves. We congratulate the Richmond Company upon this innovation. There has been room for striking-out in new directions, with the object of raising utility and general efficiency. They claim that it is a definite departure; and the description and illustrations show that the claim is fully justified and merited. We anticipate a successful outcome to this fresh evidence of enterprise, and at a time when the inducements to introductions of the kind cannot be said to be at high-water mark. Novelty, combined with large utility, will help to draw fresh custom to gas undertakings; and this should not be overlooked.

Gas Consumption and the War.

War conditions have been responsible for upward or downward curves in the consumption diagrams of different gas undertakings, according to the manner in which these conditions have affected the particular locality concerned. There is an instance of the upward curve provided by the Brighton and Hove Gas Company, who have in the past half year experienced the largest increase in sales that has ever been recorded in the history of the Company for one half year. The gain amounted to over 6½ per cent.; and in one particular respect the figure is even better than it looks. That is to say, as was pointed out by Mr. A. M. Paddon, the Chairman, at the meeting last week, that while the actual increase had amounted to over 50 million cubic feet, there had along with this been a falling off of 14 million cubic feet in the quantity of gas sold for public lighting. Thus the consumption for other than public lighting purposes was greater by 64 million cubic feet than in the six months with which comparison was made. First among the reasons for the increase in business, the Chairman placed the fact that the population had been swelled in consequence of the military precautions taken in the locality; but he also gave part of the credit to the moderate price at which the Company are able to sell gas, in these times of dear coal. The additional work that has been accomplished during the past six months is all the more remarkable when it is remembered that nearly 40 per cent. of the employees are on active service—and these, as Mr. Joseph Cash (the Engineer) fairly pointed out, are the best men. Looked at from all points of view, the record placed before the proprietors is a highly gratifying one; and the appreciatory remarks which were made at the meeting had been well earned by all those to whom they had reference.

The Abused Gasholder.

Until the judgment day, providing coal and oil supplies hold out for gas making, the gasholder will, we suppose, be a target for those artistic fanatics whose ideals extend no farther than colour, combination, and natural form. A gasholder seen from a train stirs up the ire to boiling-point of the so-called artist; the smoke and spark emitting engine, the noisy, rumbling train, running on a sinuous permanent way cut and laid through the very heart of Nature's beauty, do not excite him. The worshipper of beauty is riding in the one, and sees the other. Were he standing on the gasholder and from its height surveyed the beauty of the landscape, he would then revile the railway track and the hideous engine and train. The "Daily Chronicle" recently stated that an "artist from abroad" finds a gasholder somewhere in Surrey a cause of great annoyance; and he seems to think that such structures ought to be decked out in some fantastic style to make the beautiful piece of engineering work and utility look like something it is not. We are not in favour of theatrical "make-up" being brought in as an aid to engineering work. What is wrong about the whole matter is that the artist whose conceptions of beauty are limited to colour, combination, and form sadly wants his ideals cultivated so as to comprehend the fact that he has not a monopoly of art, and that art extends to the work of the engineer. Besides engineering art being possessed by the gasholder, it is a structure of utility—from out of it comes usefulness, value, convenience, comfort for humanity, and much else. Some of the productions of the artist are neither beautiful nor useful.

Intern the Structure.

Wilmot Corfield in "The British Architect" waxes sarcastic over the renewed absurd attack on the gasholder. To him, a reformed gasholder would be worse than a converted submarine, or a Zeppelin transformed into a summer arbour. It would be a gasholder spoiled, unsatisfactory as either submarine or Zeppelin. He makes a suggestion, but not seriously, Why not intern the gasholder? The answer is that nobody likes to be interned—not even Germans; and those who are responsible for such works of utility as gasholders prefer to have them where they can be readily seen, examined, and kept in good working order. The Germans would not think of so ill-treating a gasholder; they prefer that they shall be set on a hill so that they shall not be hid. The "hill" is a large reinforced concrete structure, the roof of which is the base of the water-sealing tank of the holder, and the under-part forms a store, into which loaded railway waggons can be passed. Thus economy of ground area projects the beautiful curves of the holder, and the standards and bracings which incorporate so much engineering art, into stronger view of the artist's eye. But perhaps artists in Germany have a deeper perception of the beautiful than, or do not lay claim to a monopoly of the beautiful as do, our home-bred artists, and artists from countries other than Germany. Wilmot Corfield suggests to those who are displeased with the symmetrical lines of the holder that "holes" should be made deep and large enough, so that the holders could be fully interned when inflated. Cost? That is a simple matter. "The cost of the conversion of existing gasholder slots to bring about the internment of these eyesores all the land over could be met out of the rates." The crescendo of satire spends itself in the lines: "After the gasholder, the Albert Hall. Turn a handle, and down would go the Albert Hall until wanted again, adding an acre or two to London's open spaces in the interval."

Pipe-Laying and Reinforced Concrete for Roads.

The necessity for improving road crusts owing to modern traffic has not lightened the expenses incurred by those who have to use the subsoil for the accommodation of their distribution systems. Concrete foundations have added to difficulty and costs in respect both of opening and reinstatement work. When, therefore, it is suggested that the concrete should be reinforced, this is sufficient on first blush to make pipe and cable owners stand aghast. It will be remembered that some time ago the Woodford and Wanstead District Councils decided to repair their roads with reinforced concrete; and the Gas Light and Coke Company applied for an injunction restraining them from doing so. The Company, however, took the very fair course of saying that, if experiments proved that there was no more difficulty with the reinforced concrete than with ordinary concrete, they would be satisfied. The action was subsequently withdrawn, through, according to the Clerk to the Woodford Council, experiments having demonstrated that the reinforced concrete was no greater hindrance to the Company's operations than ordinary concrete. Of course, this depends on the nature of the reinforcement. Some particulars are given in the "Times Engineering Supplement" of the system of the Loop Road Reinforcement Company. In this case, the reinforcement consists of parallel steel rods looped together by wire. The rods may be either in one horizontal plane or alternatively in two planes—one near the surface and the other near the base of the concrete, and may be either parallel to the longitudinal axis of the road or at an angle of 45° with it. It appears that the system allows of a lessened thickness of concrete than when no reinforcement is used, and that the reinforcement can be conveniently laid after trench openings. All the same, pipe owners must, we repeat, exercise care as to the character of the reinforcement employed.

Trading with the Enemy.

A study of the official figures published from time to time will provide sufficient justification of the warning to exporters which is issued by the Board of Trade, who direct the particular attention of all manufacturers and traders concerned in the export trade to the need for scrupulous care in the transaction of their business abroad. While expressing confidence that they can rely upon the cordial co-operation of firms engaged in foreign business to secure the successful working of the Government's reprisals policy, the Board do not omit to point out that the proclamations relating to trading with the enemy cover indirect trading through neutral agents, and that carelessness in transacting neutral business may thus involve traders in severe penalties. When this reprisals policy was inaugurated, in the early part of the year, it was, of course, directed to the suppression of all enemy trade, whether import or export. But unfortunately the main difficulty in making the policy thoroughly effective arises from the fact that "some traders in some neutral countries are making themselves agents for the supply of goods to enemy countries." It is in these circumstances British firms engaged in foreign trade are warned that they must survey with great caution every opening for business which is offered them by neutral importers or exporters. Special care, it is said, should be taken in opening new accounts in neutral countries, and in relation to any orders or inquiries of an abnormal character. In fact, it is considered inadvisable that any new accounts should be opened by British traders in neutral countries during the war without the fullest inquiries as to the character of the business proposed. In the event of any doubt arising in the mind of a trader as to the *bona fides* of any particular consignee, the direction given by the Board of Trade is that business should be suspended pending reference of the matter to the War Trade Department, Central Buildings, Westminster, S.W.

PERSONAL.

Mr. THOMAS BERRIDGE, J.P., of Leamington, has been elected to a seat on the Board of the Warwick Gas Company.

It is gratifying to see that Lieut. G. D. BIDWELL (whose misfortune in being wounded at the Dardanelles has already been intimated in the "JOURNAL"), though down with a bullet through his chest, has been able to write a post-card from the Deaconess Hospital, Alexandria. His chief regret seems to be having to lie quiet after such an active life as he has been having out there.

Among a number of rank and file gazetted Second-Lieutenants is FREDERICK BARTER, V.C., of the 3rd Battalion Royal Welsh Fusiliers, an employee of the Cardiff Gas Company. The award to him of the Victoria Cross, and the marks of appreciation of his gallant conduct bestowed upon him by the officials of the Company and his fellow workers were recorded in the "JOURNAL" for July 13, p. 88.

The Directors of the Chesham and District Gas Company have appointed Mr. FREDERICK J. ROBINSON as their Manager and Secretary. Mr. Robinson, who holds certificates in Gas Manufacture and Gas Supply, Chemistry, and Building Construction, served three years articles with Mr. George Lane, Assoc.M.Inst.C.E., the Manager of the Aylesbury Gas Company, and acted for a further period of four years as his Assistant. Since July, 1909, Mr. Robinson has been on the distribution staff of the South Suburban Gas Company at Lower Sydenham and Bromley. The annual make of gas at Chesham is 33 million cubic feet.

The retirement of Mr. W. D. CHILD from the position of Engineer and Manager of the Romford Gas Company, and his appointment as a Director, as already announced in the "JOURNAL," were referred to at the half-yearly meeting of the Company. The new Chairman (Mr. W. G. Wilshaw), in proposing a retiring allowance to Mr. Child, spoke of the good work he had done. He pointed out that the laying out and design of entirely new works were carried out by Mr. Child, who could look with pride to-day on the fruits of his work. He was glad to think that Mr. Child, though relinquishing the more active duties of management, would still retain a voice in it, and they would have the advantage on the Board of his technical knowledge and long experience of the district. Several shareholders spoke warmly of Mr. Child's splendid services to the Company; and both the proposed retiring allowance and his election to the Board were cordially confirmed.

FIFTY YEARS AT SOUTH SHIELDS.

Mr. J. H. Penney's Jubilee of Service with the Gas Company.

CONGRATULATIONS to Mr. J. H. Penney, who has completed half-a-century's service with the South Shields Gas Company, during the last forty years of which he has occupied the position of Secretary. In commemoration of the event, and as a mark of their esteem, the Directors, on behalf of the Company, have presented him with a suitably inscribed silver salver and a cheque. The presentation was made by the Chairman (Mr. James Readhead, J.P.), at a Board meeting; and, in doing so, he expressed, in complimentary terms, the appreciation of the Directors of Mr. Penney's past services, and the hope that his health would permit of him continuing his work for some time to come. The Vice-Chairman (Mr. T. W. Wallis) endorsed these remarks.

Mr. Penney at an early age was, in August, 1865, appointed from among sixty applicants Collector to the South Shields Gas Company. Mr. Robert Wallis, J.P. (who subsequently completed over fifty years as a Director of the Company, and forty years as Chairman), was then Chairman, Mr. Wm. Anderson was Vice-Chairman, and Mr. Jonathan Nelson (a brother of Mr. Henry Nelson) was Secretary. The secretarial staff at that time consisted of the Secretary, a book-keeper, and one collector. After about twelve months, Mr. Penney was promoted to the position of Rental Clerk and Cashier; and subsequently, after the death of Mr. Nelson, he acted as assistant to the then Secretary, Mr. J. W. Lawson. Ten years after going to Shields, Mr. Penney was appointed Secretary—on the death of Mr. Lawson, in 1875.

The North of England Gas Managers' Association was formed at South Shields in 1877, when Mr. Warner, the then Engineer of the South Shields Gas Company, was made first President. Mr. Penney subsequently was appointed Auditor, and afterwards became a member of the Committee, then Vice-President, and in 1896 was President. He finally acted as Hon. Secretary and Treasurer of the Association for five years, a position which he filled with much credit. On relinquishing this position, the Association made him a handsome presentation, in recognition of his services.

When the Workmen's Compensation Act first came into operation, insurance companies, having no experience in this business, quoted very high premiums; and Mr. Penney took a prominent part, on behalf of the North of England Gas Managers' Association, in persuading gas companies in Durham, Northumberland, Cumberland, Westmorland, and Yorkshire to combine, with a view to jointly obtaining insurance at lower premiums. This was accomplished; and the precedent caused a very great annual saving to the gas industry in insurance premiums under the Act. Gas companies in various parts of England subsequently joined the scheme; and, by special request, Mr. Penney addressed the Gas Institute on the subject at Belfast in 1898.

Mr. Penney was for three years a member of the Committee of the Gas Institute. The minimizing of bad debts has always been a strong point with him—so much so, indeed, that he read a paper to the North of England Gas Managers' Association some years ago entitled "How to Minimize Bad Debts." The Company's bad debts last year only amounted to £104 on £110,229—equal to 1s. 10½d. per £100. In the past, Mr. Penney was often asked by directors and officials of gas companies to nominate candidates for official positions. He has always taken a great interest in training secretarial apprentices; many of them (Union British School boys) now holding excellent positions in various parts of England and abroad. In Jubilee Year (1887), a Royal Mining Engineering and Industrial Exhibition was held at Newcastle-upon-Tyne; and the Executive Council appointed Mr. Penney a member of the Gas Lighting Section Committee. He acted as Hon. Secretary for the section.

The following comparison of some of the chief items in the Company's receipts and expenditure in 1865 and last year indicates the growth of the business during Mr. Penney's service.

		1865.	1915.
Receipts	Gas	£6852	£82,433
	Tar	464	5,063
	Coke	505	14,899
Expenditure	Coals	£1949	£36,395
	Rates and taxes	331	5,489
	Wages	1320	26,293
Total	Income	£8201	£110,234
	Expenditure	6032	87,946
	Profit	£2169	£22,288
	Price of gas	3s. 8d.	2s. 6d., less discounts varying from 7½ p. ct. to 20 p. ct.
	Dividend	8 p. ct.	8½ p. ct.

Mr. Penney's courteous and kindly disposition has endeared him to all who know him. He is a Freemason of long standing, and was W.M. of his Lodge many years ago. Three sons of his are now serving with the army.

GAS ACTS FOR 1915.

[First Article.]

The review of the few Acts dealing with gas supply passed in the present session of Parliament will not be a very heavy task. There were no new or non-statutory companies applying for full parliamentary powers; and, as readers are aware, the amount of contest over the measures was not great—such variations as were made having been accomplished by quite pacific means. We shall only notice the principal alterations made since the Bills were reviewed, as in some cases it would merely mean a reproduction of the greater part of the information then supplied. It may be mentioned here, to save announcement in each case, that the clause inserted in the measures, at the instance of the Treasury, and relating to the raising of money during the war, is as follows:

> Notwithstanding anything in this Act, the Company shall not, under the powers of this Act, raise or borrow any money during the continuance of the present war and twelve months thereafter, unless the consent of the Treasury has been previously obtained.

Only nine Bills were promoted by statutory companies for extended powers; and they have all become law. The review of the Bills appeared on Jan. 5 last; and the particulars then supplied must be read in conjunction with those now published in regard to the Acts.

There is no essential change to record in respect of the Altrincham Gas Company's Act. But in connection with the calorific power clause, it is seen that the Company are, when required by a consumer at any time within two years after the commencement of the Act, to supply and fix free a sufficient number of flat-flame burners suitable for the consumption of gas of the prescribed calorific power in substitution for burners (not being incandescent ones) in use at the beginning of the Act. The Act is bulkier than the original Bill—the cause being the granting of protective clauses to the Cheshire Lines Committee, to the London and North-Western Railway Company and the Great Central and North-Western Railways Joint Committee, to the Cheshire County Council, and to the Urban District Councils of Altrincham, Hale, and Bowdon, and the Rural District Council of Bucklow. [*Parliamentary Agents: Messrs. Billing and Co.*]

The Ascot District Gas and Electricity Company's Act modifies in two or three particulars the proposals in the Bill as lodged. Power was originally asked to raise additional capital to the amount of £35,000 by the creation and issue of new ordinary or preference shares or stock; but in the result £50,000 was the sum allowed. The suggested clause providing for the suspension of the auction clauses during the period of five years from the date of the passing of the Act, or within such longer period as the Board of Trade might sanction, has been deleted. The idea was to give the Directors greater freedom in raising capital during the time of financial stringency owing to the money requirements for the war. It was also asked that the total amount of the borrowing powers should, with the sums already borrowed, aggregate £75,000, but that no sum should be borrowed in excess of an amount equal to three-fifths of the paid-up capital for the time being. What happened in this connection was that the £75,000 was altered to £70,000, and the three-fifths to one-half. So that this is a departure from the standard one-third; and the Company can make greater use of their credit in raising money. The other powers sought, as noted when reviewing the Bill, were granted. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Act of the Brighton and Hove Gas Company confers on them the territorial extensions sought; and the other powers desired. In connection with the two clauses granting power to make donations and subscriptions to institutions and funds, and to provide for benefits to employees and dependants of employees killed in, or dying as the result of, the war, it is now provided that the total amount of the payments to be made by the Directors out of the Company's funds and revenues, under these sections, is not to exceed a sum equal to ½d. per 1000 cubic feet of gas supplied during that year. Another clause gives power, in addition to forming a benefit fund under the Company's Act of 1912, to grant pensions and retiring or superannuation allowances to officers and servants (other than weekly servants). For this purpose, the total payments to be made in any year is not to exceed an amount equal to ½d. per 1000 cubic feet of gas supplied during that year. These are the only changes. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Ilfracombe Gas Company's Act is practically a reproduction of the Bill. This is the first measure that falls for notice with a level standard of 500 B.Th.U., instead of the model 540 B.Th.U. and the margin of 7½ per cent. Regarding the adoption of the sliding-scale, the proposed standard price has been lowered from 3s. 8d. to 3s. 6d. The electricity supply powers for Combe Martin, and all other suggested authorization noted when the Bill was reviewed, have been granted. [*Parliamentary Agents: Messrs. Lees and Co.*]

The powers contained in the Act of the Northwich Gas Company are an abbreviation of the proposals contained in the Bill. The new lands and works powers were withdrawn as a result of strong objection; but the extension of the limits of supply to the district of Weaverham has been secured. The Cheshire County Council have obtained protection, and so have the Cheshire Lines Committee. The even calorific power standard of 500 B.Th.U. has been allowed. The sliding-scale proposals have been expunged. All the other clauses remain, including those referring to the conversion of capital, additional capital, and borrowing powers. Introductions allude to purchase provisions in favour of the District Council. The power is exercisable by the Council in the next session of Parliament; and, upon the passing of the Purchase Act, the Council are within six months to give the Company the necessary notice of their intention to acquire the undertaking. Failing agreement, the purchase price is to be determined by arbitration. In addition to the purchase price, the Council are to pay to the Company the costs incidental to the obtaining of the Act, the watching or procuring of any amendment of the Bill to be introduced by the Council, and the sum of £200 in respect of the transfer of the undertaking and the winding-up of the Company. Compensation is also provided for the Directors, officers, and servants. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Ormskirk Gas Company have secured their proposed new land and works powers; and in regard thereto, the Act states, in the words of the Model Clause, but without the restriction incorporated in the model:

> The Company may also upon the said lands—
> (*a*) Work up and convert the residual products arising directly or indirectly from the manufacture of gas by them.
> (*b*) Purchase the residual products arising from the manufacture of gas by other gas undertakers; and therewith manufacture other products of the same kind as the Company are manufacturing from their own residual products.
> (*c*) Purchase from other gas undertakers and elsewhere, and use, the materials required to work up and convert the residual products so arising from their own manufacture of gas or purchased as aforesaid.
> But the Company shall not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings, or in the manufacture of which the use of residual products produced by the Company, or purchased from other gas undertakings, is merely subsidiary.

The calorific power clause has had the standard raised to 550 B.Th.U. from the model figure of 540 B.Th.U.; but the other conditions continue. We do not now notice the provision referring to exemption from penalty or forfeiture by reason of the presence in the gas of sulphur compounds other than sulphuretted hydrogen. The District Council of Lathom and Burscough have obtained a clause providing for the Company making certain main extensions within specified times, providing they can get the Treasury to sanction the raising of the necessary capital. A clause referring to future general legislation succeeds:

> This Act shall not, by reason only of the enactment of the provisions thereof, confer any exemption from any general legislation relating to the supply of gas which may be passed in this or any future session of Parliament; but the provisions of this section shall not be construed as preventing the conferring of any such exemption, or the enactment in any such general legislation of any special provisions relating to the undertaking of the Company.

The electricity powers for Aughton are granted; but purchase powers over the electricity concern, exercisable after ten years from the date when the Company commence to supply current, are conferred upon the West Lancashire Rural District Council. The capital and other powers conform with the proposals at the time the Bill was lodged. Protective clauses are accorded to the Lancashire County Council and the Lancashire and Yorkshire Railway Company. [*Parliamentary Agents: Messrs. Butterworth and Co.*]

In the Prescot Gas Company's Act, we have, in connection with the construction and maintenance of gas-works clause, the residuals clause contained in the Ormskirk Act, and as quoted *in extenso* in the foregoing notice of its provisions. The conversion of capital powers has been granted; but the additional capital powers have been reduced from £22,500 to £18,000. The borrowing powers are as proposed. In this case, the calorific power standard has been altered from the 540 B.Th.U., with 7½ per cent. margin, to the level standard of 500 B.Th.U., without margin. The pressure clause provides for 10-10ths; but as regards the parish of Knowsley 12-10ths is specified. Provision is also made for illuminating power testing, without forfeitures. The clause referring to the price to be charged for gas for public lighting seems to us to be too wide. After "consumer," the words "for lighting" should have been inserted. The clause reads:

> The price to be charged by the Company for gas supplied by them to any public lamps shall in no case be higher than the minimum charge for the time being made by the Company to any private consumer within the limits of supply.

In the provision exempting fittings on hire from being subject to distress, "dynamos" is mentioned. The maximum price of gas fixed by the Act of 1880 is repealed; and it is now provided that it shall not exceed 4s.:

> Provided always that, if payment be made on demand on the delivery of the quarterly account, or at the office of the Company within one month from such delivery, the Company shall make a deduction by way of discount of 10 per cent. on the price of gas so supplied.

Protection has been given to the Lancashire County Council, the Whiston Rural District Council, and the London and North-Western Railway Company. In the clauses in favour of the

Lancashire County Council, it is provided that for road-surface reinstatement work—

> The Company shall in respect of the area of the trench or excavation where the same is situate under the metalled surface of any road on demand pay to the County Council an amount calculated at the price or rate of 15s. per cubic yard for reinstating concrete foundation, 2s. 6d. per superficial yard for relaying pitch-grouted sett pavement, 2s. per superficial yard for relaying water bound macadam, and 3s. per superficial yard for reinstating tar macadam. Provided that, if the County Council make any delay in completing the reinstatement and making good of such road in accordance with this sub-section, the County Council shall indemnify the Company against all costs, charges, expenses, and penalties to which they may become liable by reason of such delay or failure.

There are no other variations in the Act as passed, that need be noticed. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Spennymoor and Tudhoe Gas Company have secured their land, capital, and borrowing powers, the marginless calorific standard of 500 B.Th.U., the right to supply dynamos among other apparatus, and, in short, all the powers sought by the Bill as deposited, and as noticed in our review of its main features. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Town of Warwick Gas Light Company are empowered, by their new Act, to drop the words "Town of" and "Light" from their title; so that "Warwick Gas Company" will henceforth be the correct designation. The new Act puts the Company on modern parliamentary terms. The general purposes clause, which originally proposed to give the Company power to purchase, manufacture, and deal in, residual products, now omits all direct reference to residuals, and states: "The Company shall continue to be, and shall be established, for the purpose of manufacturing and supplying gas for lighting, heating, and motive power, and other purposes within the limits of supply, and generally may carry on the business usually carried on by a gas company." Attached to the construction and maintenance of works clause are the residuals powers as conferred on the Ormskirk and Prescot Companies, as already noted. Regarding the conversion of the capital, there have been a couple of modifications. The existing shares are to be converted into ordinary 5 per cent. stock, to the amount of £50,000 (instead of as proposed £56,000), to be divided among the holders of existing shares in the proportion of £166 13s. 4d. (instead of £186 13s. 4d.), of ordinary stock for every £50 share in the original capital. The additional capital and borrowing powers are as in the Bill, except that the borrowing powers in respect of the ordinary stock into which the existing shares are to be converted are reduced to £16,666 (instead of £18,666). The lands and works clauses, and the provisions as to the purchase of the Barford Gas Company are intact—the maintenance of works clause including the residuals powers already referred to. All the other proposals, including the level 500 B.Th.U. calorific standard, are as alluded to in the notice of the Bill. Protective clauses have been given to the Lancashire County Council, the London and North-Western Railway Company, and the Great Western Railway Company. [*Parliamentary Agents: Messrs. Lees and Co.*]

Photometric Work at the Charlottenburg Institute in 1914.

According to the report on work done last year at the Imperial Physical-Technical Institute (Reichsanstalt) at Charlottenburg, 74 Hefner lamps were examined and certified—making a total of 2153 Hefner lamps certified since the Institute undertook their verification in 1893. There were also examined for use as photometric standards 113 carbon filament and 261 metallic filament electric lamps. Previous experience has shown that carbon filament lamps are more suitable than metallic filament lamps for use as standards of light. Tests for durability or lighting power were made on four inverted gas-burners, and on various electric lamps. The four gas-burners were tested at pressures of 14-10ths and 20-10ths of an inch of water. The most favourable result from these inverted burners was 31·85 English candles (35·4 Hefners) mean lower hemispherical illuminating power per cubic foot of gas consumed. Durability tests of four "half-watt" electric lamps showed that the mean hemispherical illuminating power fell off by about 20 per cent. The consumption per English candle mean lower hemispherical illuminating power rose during the test from 0·50 watt to 0·61 watt.

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Lighting of Berlin.—In their column of notes from German sources, the "Daily Telegraph" on Saturday last said that the "Deutsche Tageszeitung" gives some interesting details about the street and domestic lighting of Berlin. The total number of gas-jets in nightly use at the end of June was 34,754—showing a reduction of 2700 as compared with the corresponding period of last year. In the case of only 6489 has there been any reduction in the burning time. In the first half of 1915 there has been a reduction of 10 million cubic metres, or 6 per cent., in the quantity of gas produced at the Municipal gas-works. In addition to gas, the streets of Berlin were also illuminated by 42 petroleum lamps, 21 spirit lamps, and 1000 electric lamps of various sorts. Owing to the scarcity of petroleum, there has been a considerable increase in the number of automatic slot meters—no fewer than 34,582 new ones being installed in the first six months of this year. The number of slot meters in use on July 1 was more than 200,000.

ELECTRICITY SUPPLY MEMORANDA.

Capital for Competing Concerns.

Some heavy loans have been granted by the Treasury and Local Government Board to electricity supply undertakings in the industrial areas—loans considerably exceeding in amount anything sought by gas undertakings, the managements of which make the best possible use of their floating balances for the carrying-on of business as near to the customary methods as conditions over which they have no control will permit. It is notorious that relatively few electricity undertakings have anything in the way of floating balances; and many of them have no reserve, depreciation, or other such funds. They must be capital-fed up to the hilt. When the considerable loans sanctioned to municipal electric undertakings since the war commenced are compared with the comparatively small amounts of capital allowed by the Treasury to gas companies, it savours of greed for complaint to be made from the electrical side as to gas capital issues. "Fair Play," writing to the "Electrical Times,' has a growl on the subject. His fictitious name does not fit the growl. The cause of offence is that the South Metropolitan Gas Company have invited their consumers to subscribe for a further amount of capital; and this with the sanction of the Treasury. "Fair Play" wants to know whether the Treasury have imposed the same conditions upon company expenditure as they have done, through the London County Council, on London municipal electric undertakings. The reply is that they have; and if "Fair Play" had only acted up to his adopted name, and not been so short-sighted as to neglect inquiry, he would have found that the Treasury had very good reasons for allowing the South Metropolitan Gas Company to raise capital from their consumers. Perhaps he will consider this one point, that the amount of the Company's loan from their bankers stood at the end of June last at £360,000; and the new capital, if the Company's consumers have been so good as to take it up, will release part of this. Those people who adopt "Fair Play" as a *nom de plume* have not always the capacity for looking beyond their noses. Here, there was a circular from a gas company; the electrical man scented favouritism; and away he rushes into print in the "Electrical Times," and makes a stupid of himself. Even if favour in capital provision were shown to gas undertakings—they are not asking for favour, and do not expect it—no great complaint could be made, seeing that the more business they can get, and the more coal there is carbonized, the greater the source from which the industry can supply the country with those necessaries to the making of high explosives, and to accomplishing victory for this country and her Allies. We wonder whether "Fair Play" is one of the individuals who a time ago was screaming out "Gas must go." In these days, when English gas-works are doing so much to save the situation from the effects of a vast short-sightedness on the part of the Government and its red-taped bureaucracy, those individuals must recognize themselves as arrant fools.

An Equal Footing.

The same individual asks: "Why not instruct the County Council to modify their attitude in restricting periods for loan repayments, so as to allow the electricity undertakings to compete with the companies and gas on an equal footing—the only fair and British way." If everything was removed that contributes to the putting of competition on an unequal footing between municipal electricity and private enterprise in gas supply, the result would be greatly in favour of the latter. Municipal electricity supply authorities would then not be allowed to fall back on the rates for making-up the deficits of mismanagement, or issuing from the conduct of business on lines that do not obtain in private business concerns. Electricity would not be allowed to be supplied at a price for one purpose at anything from (say) one-sixth to one-twelfth part that for which it is supplied for another purpose. Local authorities would have to put up to competition the lighting of the streets and public buildings, instead of as now tapping them as lucrative sources of revenue for their own electricity undertaking without caring a fig for the economy and efficiency for which, irrespective of the agent employed, the ratepayers are alone desirous of paying. There would also be a stop put to those acts of certain municipal departments which have for their object the promotion of applications for domestic electric lighting for roads in which cables are not laid; and then, on the strength of these applications—*bonâ fide*, remunerative, or otherwise—to get permission to lay cables and to convert street-lamps *en route* to electricity. Competing private gas enterprise, too, under the "equal-footing" competition scheme of "Fair Play," would not be called upon as a large ratepayer to contribute to the support of a trading rival. The irony of fate never had more freakish exemplification than this. In all the flights of Gilbertian imagination, a more grotesque position than this was never conceived. Yes, we agree whole-heartedly with "Fair Play" that the only fair and British way would be to put on a trading equality private gas enterprise and municipal electricity undertakings, by making the latter conform with business principles and be conducted in the same manner that a private individual or private company would do his or their business to earn a profit on the capital involved, and to obtain some reward for the exercise of brains and skill.

On "Higher Grounds."

While on this subject of competition on equal footing which "Fair Play" so much desires, we should like to ask the "Electrician" why it is so shy about discussing the question of the Northumberland clause from the points of view of the ratepayer and of private competing enterprise. We gave our contemporary material for dilating upon these points in the "Memoranda" in the "JOURNAL" for July 27; but it prefers to deal with the subject on the same old lines, and to expose to view again and again the same old arguments. However, we will have another try to bring our contemporary to a public consideration of the matter from the standpoints of justice to the ratepayers and to private competing enterprise. We do so now with a fair amount of assurance that it will comply. The assurance arises from the fact that, after referring in its last utterances on the subject, to what it regards as the difficulty of applying the Northumberland clause to a small section of a big electricity supply concern, it says that it is opposed to the principle of the clause on "other and higher grounds." When one finds a man who is willing to consider a controversial question on the "higher grounds," it may be taken that his sense of justice will permit his survey to be of a very complete character. One of the "higher grounds" upon which our contemporary pitches its arguments is that "no unfair check or hindrance should be placed upon it [the municipal electricity undertaking] in its endeavours to perform its public obligations." That is good. Will our contemporary tell us why any "unfair check or hindrance" should be placed on a fully assessed and rate-loaded private gas enterprise by reason of a municipal electricity department being, in the name of so-called progress, carried on in a manner to increase the rate-paying burden falling upon the rival enterprise? The greater this burden, the greater the "check and hindrance" to the progress of private gas enterprise. "Unfairness" forsooth! The term lies in the mouths of some electrical people with the same appropriateness as the protest of the burglar against the injustice of conviction and sentence, when awarded "six months' hard" for breaking open a refrigerator which he had mistaken for a safe. "Unfairness!" The competitive methods of some municipal electricity concerns are well enough known. The illegal preferential terms, the trade slanders, and the attempts made, through the dominating position of the local governing body, to crush the life out of private gas enterprise, are not electrically regarded as "unfair checks and hindrances" on the gas industry. The gas industry has its own opinions in regard thereto. The "Electrician" should carry out to the full its purpose of considering this matter upon "higher grounds." Then it would see that the Northumberland clause is not intended "as a check upon competition and upon progress," but it is the nearest approach to which one can get in compelling municipal electrical traders to conduct their business on the lines that private enterprise has to pursue if it does not desire to consummate its career in a Bankruptcy Court. The fairest competition is when a gas company and an electricity company are the opposing commercial forces, out to make fair profit and reward, but with no rate-backing, nor the inducements to a looseness of management that municipal trading harbours. They are on equal terms. But in the other case, the stronger the competition from private gas enterprise, the greater the proneness of the municipal opponents to indulge in applying the screw of uncommercial and unfair practices. Why municipal undertakings should be pampered in the early years of their running any more than a gas or electricity company, we cannot for the life of us tell. When the "Electrician" started, it did so to make way, or collapse in the attempt, without any support but that afforded by private money and brains. It started without any statutory power to abuse ordinary trading principles; and it is with us today. By the way, we put before our contemporary, in our issue for July 27, an illustration in relation to this matter. If it will discuss this, it may help it to view things broadly and fairly from the "higher grounds" of this particular question.

The Crude Light and External Refinement.

Electric lamp and lighting developments in the near past and future is the subject of some articles contributed to the "Electrical Review," by Mr. L. Crouch. There is nothing to which exception can be taken in the first article Mr. Crouch does not claim for electric-lamps a merit without defect; but his main purpose appears to be to see how something better can be evolved from the crude lights electrically generated. Whether the light be obtained by an electric arc or whether it is developed by filaments raised to incandescence by very high temperatures, one can only look upon the resulting harsh, eye-injuring, intrinsic brilliancy as something that is very crude, and wants refining by external means before being brought into use. However, Mr. Crouch thinks it would be a great pity if advantage were not taken of the present opportunity of suppressed public lighting to investigate carefully the best polar distribution for street lighting—more particularly with regard to the use of new types of globes and reflectors. The old system of street lighting was often crude; and therefore it is thought that steps should be taken to see if permanent good cannot be evolved from present evil. It is also hoped by the writer that, after the war, there will be proper control of privately owned lamps and signs on the exterior of buildings. The hope has our hearty sympathy. But poor hard-pressed architect! Things are running at such a pace now that in every element of a building, he is expected to arrange for things upon the "scientific" lines laid down by the specialist. Now we have Mr. Crouch a warm advocate for insisting on architects making some provision for the "harmonious accommodation" of electric signs when designing buildings on which it is certain they will be used. We do not know who is to have the power of "insisting," save the person who pays for the building; and outside signs generally find application just where use was never premeditated. As to domestic and other small unit lamps, Mr. Crouch says: "Agreed as we all are on the desirability of low intrinsic brilliancy in luminous sources, it is curious that we seem to get farther away from our ideal." If Mr. Crouch will work backwards in the order of intrinsic brilliancy of lighting agents, he will leave the electric filament lamps and come to the comparatively low intrinsic brilliancy inverted incandescent gas-lamps, with a bearable intrinsic brilliancy. Looking on the high intrinsic brilliancy electric filament lamps as an "intolerable" source of light, the contributor points out the importance and necessity of making the light tolerable by means of reflectors, refractors, and diffusers. There is a nasty smack at illuminating engineers. Mr. Crouch thinks that "scientific" precepts have been carried too far in illuminating work. "Many of the rules and methods advanced encourage a false sense of security, and are apt to give very disappointing results when applied by 'illuminating engineers' of limited experience and great faith." Mr. Crouch will be losing some of his friends if he lets himself go in this unrestrained fashion.

The Arc Lamp Maker and "Half-Watts."

We have been recently reminded by the "Electrician" that little is now heard of arc lamp development. If the war does not hasten to an end, arc lamps will before long almost have vanished from useful existence. They are only seen now shaded and hooded as though utterly ashamed of themselves. This is, of course, by order; and owing to the scarcity of carbons and labour, street-lighting authorities, with these expensive sources of illumination in the streets, are scrapping them, and putting in "half-watts," which do not require so much labour, nor ask to be periodically fed with carbons. But notwithstanding the exodus of the arc lamp through a combination of misfortunes, our contemporary suggests that the arc lamp makers are not likely to relinquish their hitherto lucrative businesses without a big struggle. We do not suppose they will; on the contrary, the lamp that is deposing their wares ought to act as an incentive to attempts to improve the latter. There is the difficulty that past improvement in efficiency with the arc lamp has brought in its train increased troubles and increased costs for labour and maintenance. The flame arc lamp enhanced efficiency; the fumes and *débris* from the carbons soon discounted the efficiency. The fumes, too, acted deleteriously upon the metal parts of the lamps. Frequent cleaning, adjustment, and repair were in consequence necessary. Costs increased apart from current and carbons. The magazine lamps had some effect in reducing lamp labour. But there again mechanical devices had not a comfortable home in the heads of the lamps; and they brought their debits to set against the credit of reduced labour. There is room for much improvement; but how to achieve it is not an easy matter. However, the "Electrician" appears to be more optimistic than the members of the arc-lamp trade; for it thinks the interruption in business will afford a unique opportunity for the arc lamp specialists to investigate the properties of salted metal electrodes, and to arrange for their production on a commercial scale. Our contemporary appears to be filled with the belief that this is the road to salvation for the depressed arc lamp makers. If they neglect it, well then they may take it that their industry, by the time the end of the war comes, will be practically defunct. The arc lamp makers know full well there are other things besides the development of carbons which must claim attention, through the new competition set up against them by "half-watts."

New Carbons.

The incident inspiring the views of the "Electrician" on the subject of what the arc lamp makers must do if they do not want to prematurely shuffle off these mortal coils, appears to have been the arrival of the intelligence that Messrs. F. Lewis and H. G. Hatfield have developed new salted carbons for arc lamps, known as the "Crusta," and made by a German firm. Briefly described, the positive carbons consist of a tube of homogeneous carbon, surrounded by a jacket, formed of a mixture of salts, containing fluoride of calcium, tungstate of sodium, and chromate of potassium. It is claimed that the jacket of salts causes the rate at which the carbon burns away to be extremely slow. The arc lamp makers, if they are in a position to adopt the new carbons, will hope this is so. As to the negative carbon, this is an ordinary homogeneous cored one; the composition of the core only departing slightly from the normal. Among the asserted merits of the carbons are that the arc burns quietly; that there is an enhanced lighting effect, produced mainly by the formation of a coating on the ends of the carbons, which are readily moistened by the molten illuminating salts, so that the latter are fed thereto in ample quantity; and that there is no accumulation of residues from the salts during burning. But the carbons must be used in a vertical position to obtain these results. This shows that they are not applicable to all types of lamps—in fact, a special lamp for them has been constructed, also in Germany. This lamp, it is stated, will run forty to fifty hours with one pair of carbons, at an efficiency of 0·14 watt per hefner unit with continuous current, including losses in the resistance.

"Half Watt" Behaviour. "Electrical Engineering" has drawn attention to an article by Dr. K. Mey, of the A.E.G., of Berlin, on the behaviour of half-watt lamps. The behaviour is about what might be expected of anything possessing modern developed German characteristics. The filaments of these lamps, it is pointed out, require more energy to bring them to the same temperature in nitrogen as *in vacuo*, so that the better efficiency is only attained by using a much higher temperature. The filament burns out, however, owing to rapid vaporization, unless it is spiralized or arranged in some other way to occupy only a small space, so as to limit its capacity for giving off heat to the gas, when only a moderate increase in temperature is necessary to make up for the loss of heat. It is found that the permissible rise in temperature corresponds to a lamp efficiency of 0·65 watt per mean spherical Hefner unit. [We wonder why our electrical contemporaries persist in calling a Hefner unit Hefner candle power.] A 110-volt Hefner unit lamp has a filament spiral about 145 mm. long and 0·62 mm. diameter, and emits 10·7 Hefners per sq. mm. of surface, and the gas in it is at two-thirds atmospheric pressure. The efficiency based on the mean hemispherical candle power (without lantern or reflector) is said to be 0·5 watt per Hefner unit; and it is estimated that the loss of about 7 per cent. by obscuring the globe is approximately compensated for by using an outside reflector. A curve in the article shows the dependency of candle power and efficiency on voltage; and it appears that the variation is in about the same proportion as that of an ordinary tungsten lamp. A 5 per cent. drop in voltage reduces the candle power by roughly 15 per cent.; but the wattage per candle only increases from 0·5 to 0·55. A 5 per cent. increase in voltage sends the candle power up about 20 per cent., and reduces the wattage per candle to about 0·45. But what about life? At 10 per cent. below normal voltage, the candle power is still nearly 75 per cent. of the normal; and the wattage per candle power about 0·62.

German Truth as to "Half-Watts." Our electrical friends cannot long continue to maintain the hollow pretence that the "half-watt" lamp in performance justifies its cognomen. We have lately seen that Dr. Ives and other scientific men will not subscribe to the deception. They prefer the description of "nitrogen filled lamps." We are not in the habit of applying to Germany for truth in these days; but an advertisement in the "Electrotechnische Zeitschrift" does get nearer actuality than the "half-watt" advertisements in our home electrical papers. The German advertisement gives a list of lamps for 100 to 130 and for 200 to 250 voltages. Both mean spherical and horizontal candle powers are given for the lamps. In no case does the former reach ½ watt per Hefner unit (0·9 candle power); and the horizontal power only reaches ½ watt per Hefner in the larger sizes. The 150-watt 100-volt lamp has a horizontal power of 240 Hefners, and the 200-volt lamp of the same wattage only 200 Hefners—*i.e.*, 0·75 watt per Hefner. This has better approximation with the photometrical tests made in this country than has the pseudo appellation with which this class of lamps has been endowed.

The Late Mr. Edward Allen.—The current number of the "Journal des Usines à Gaz" contains a reference to the late Mr. Edward Allen, who, as President of the Institution of Gas Engineers, was an honorary member of the Société Technique du Gaz en France. The writer of the paragraph speaks of him as an accomplished "gentleman" (using the English word), who was highly considered by all his colleagues. He was at the head of an important Company in which he had risen by successive steps till he reached the high position which he deservedly filled by reason of his works; and he was also a member of the Government Commission on Explosives. His removal by death has caused general regret; and our contemporary expresses deep sympathy with the Institution of Gas Engineers in the loss they have sustained. The September "Bulletin" of the British Commercial Gas Association also opens with sympathetic reference to Mr. Allen's death, over the initials "F. W. G." It is pointed out that from the earliest inception of the movement he was an ardent supporter of the Association, and that on the Executive and General Committees he "gave wise and valued counsel with that modesty and that amiability which were two of his most marked characteristics. As President, from June to October, 1913—a period which included the Second Annual Conference, opened in the historic Guildhall of London by the Lord Mayor, and concluded at the National Gas Congress and Exhibition—Mr. Allen showed at his very best; and in moving and carrying the resolution altering the rules, as a result of which he vacated the presidential chair after only four months' tenure, so that it might in the future be occupied by a President elected by the Association instead of automatically being filled by the President of the Institution, he exhibited at once the unselfishness and the statesmanlike attitude which marked his every act. In the organization and the carrying through of the Jubilee-Centenary Exhibition, Mr. Allen, as Chairman of the General Committee, gave thought and work without stint, and with unbounded enthusiasm."

THE GAS CHEMISTS' SUMMARY, 1914.*

Reviewed by J. T. Sheard, F.C.S.

When Mr. Hendrickson first essayed to summarize the periodical literature of gas chemistry a year ago, it was my privilege to commend the book to "Journal" readers. Another volume, dealing with the literature of 1914, is to hand. In its compilation the author has adhered to the plan of the former work; an epitomized rendering of the several communications dealt with being strung together into a connected narrative arranged under suitable headings. While the number of separate papers or other publications analyzed remains about the same as last year, the book itself has expanded from 123 to 167 pages. Is it a sign of increasing attention being paid to chemical technology that the enlargement of the book is chiefly noticeable in those chapters which are concerned with the more strictly chemical subjects?

It is unnecessary for me, especially after what I wrote on the subject a year ago, to enter upon an analysis of the contents of the volume, which would be to review the gas literature of two Continents throughout a whole year. It must suffice to say that, after a careful perusal, I have nothing but praise for the book. It fulfils a useful purpose in gathering together, and enabling easy reference to be made to, much valuable information which is liable to get forgotten after a brief spell of publicity in current periodicals. A very complete index, and a system of indicating the subject-matter by means of heavier type in the text, both contribute to this end; while an extensive bibliography enables the reader to follow up the subject at greater length if it is desired. A few typographical errors, which will not, however, cause the reader much confusion, are the only imperfections in a useful and excellent book, for which there should be an ever-increasing demand.

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* The Gas Chemists' Summary, 1914. By A. V. Hendrickson, F.C.S. London: Walter King; 1915. Price, 3s. 6d.

COAL OUTPUT IN 1914.

The first of the four parts into which the Home Office report on Mines and Quarries for 1914 is divided was issued last week, and furnishes in summarized form certain information which will be available in more detail in Part III. Mr. R. A. S. Redmayne, Chief Inspector of Mines, signs the present Blue-Book, which deals with divisional statistics.

It is stated in the report that in the year 1914 the total output of coal in the United Kingdom from mines under the Coal Mines Act was 265,643,030 tons. Adding to this 21,363 tons from open quarries, the total output of coal was 265,664,393 tons. This is a decrease of 21,766,080 tons on the output of the previous year, which was 27,014,135 tons more than the figure for 1912, when the national coal strike took place. The decrease in 1914 of the coal production in the several inspection divisions, as compared with the output for the year before [including the small quantities obtained from quarries], is shown to be as follows: Scotland, 3,609,154 tons; Northern coalfield, 6,291,149 tons; York and North-Midland division, 6,140,697 tons; Lancashire, North Wales, and Ireland, 1,920,959 tons; South Wales, 2,950,565 tons; and the Midland and Southern coalfield, 853,556 tons.

Last year, in view of the heavy depletion of mine labour due to recruiting in the final months of the year, owners of mines under the Coal Mines Act were asked to return both the number of persons ordinarily employed during the period from January to July, and the number that were employed on the last pay-day in December. It appears from the replies sent in that for the period from January to July the number of persons ordinarily employed at the 2988 mines under the Act was 1,133,746; but that on the last pay-day in December, 1914, the number actually employed had fallen to 981,264. Of the larger figure of 1,133,746, there were 915,381, or 80·7 per cent., employed below ground.

At the mines working under the Act, there were 1182 separate fatal accidents, causing 1219 deaths. Compared with 1913, this was a decrease of 38 in the number of accidents, and of 534 in the number of deaths. The total number of non-fatal accidents occurring during the year which disabled for more than seven days was 158,541; the number of persons injured being 158,862. The death-rate from accidents of the underground workers, last year, at the mines under the Coal Mines Act—calculated on the number of persons ordinarily employed during the period from January to July, 1914—was 1·19 per 1000 persons employed, as against 1·74 in 1913; the death-rate of the surface-workers, on the same basis, being 0·61 per 1000, as compared with 0·79 in the previous year. The figure for the two classes of workers taken together was 1·08 per 1000 (against 1·55 in 1913), being the lowest on record for the United Kingdom.

The September issue of "A Thousand-and-One Uses for Gas," a copy of which has been received from the British Commercial Gas Association, contains a number of illustrations; and, being a "Domestic Hot-Water Number," there are to be found in it special articles dealing with a branch of gas supply which is daily increasing in importance.

WIDENING THE FIELD OF RADIANT HEAT DISTRIBUTION.

Richmond "R.H.D." Fires—An Innovation.

Development in ideas usually precedes material progress—the one inducing research with the view of attaining the other. Of late years there has been a considerable aggregate improvement in connection with gas-fires. Radiant efficiency in relation to the heat generated by the combustion of the gas has ascended by leaps and bounds, until we have reached something that looks like being within measurable distance of the maximum. Gas-fires have been rendered silent in use, or practically so. They are tabooed to-day unless hygienically perfect. Form and design have been enhanced, so that there is not the ugly mass of surrounding heat-absorbing ironwork, which detracts from radiant efficiency, and increases the convected heat. The improvement of form and design, and an appreciation of the essential as to the fitness of a gas-fire to environment, have rendered the gaseous method of heating suitable for any apartment, whether exquisitely or modestly furnished.

Radiant Efficiency and the Factor of Distribution.

In the development of gas-fires, however, the greatest attention has been given to the production of the highest radiant efficiency. What is radiant efficiency? It has been construed as the yield as radiant heat of the largest possible percentage of B.Th.U. generated by the combustion of the gas; but radiant efficiency has not hitherto taken into account, as it should do, the factor of distribution. The heat radiations from the gas-fire, travelling in straight lines, have been delivered to a room in bulk so to speak; in other words, the field of distribution has been comparatively narrow. The result of this is that only the solid bodies within this limited field of distribution are heated up, and then part (as is proper) with their low-temperature heat to the air of the room. In view of the narrowness of the field within which the radiations operate, there cannot possibly be equality in the warming-up of the walls, furniture, and other bodies in a room; and therefore room-heating efficiency is not of the high standard which would result if a better distribution were effected. A greater perfection is worth attaining; and if by the widening of the field of distribution, a better diffusion of the radiations can be obtained, further progress in scientific heating will be realized. What is wanted is that the radiations shall be directed to every quarter of a room—penetrating to the walls and corners, or coming in contact with the solid bodies, in all parts. It cannot be claimed that this is accomplished with any flat-faced or bow-fronted fire, situated on one side of a room—no matter whether the fire be fed with solid or gaseous fuel. But the gaseous fuel fire lends itself better than others to attempts to secure greater diffusion of the radiant heat developed.

The Richmond Semi-Circular Fronted Fire—Increased Radiant Efficiency.

The Richmond Gas Stove and Meter Company, Limited, have been at work upon this subject; and they have produced a fire—the "Radiant Heat Distributor" (or "R.H.D.") gas-fire—which opens out the field of radiant heat distribution like a fully expanded fan. In other words, by constructing the front of the fire so that the vertical radiants are disposed in semi-circular form, instead of being in a straight line, radiant-heat distribution is successfully effected to all parts of the room.

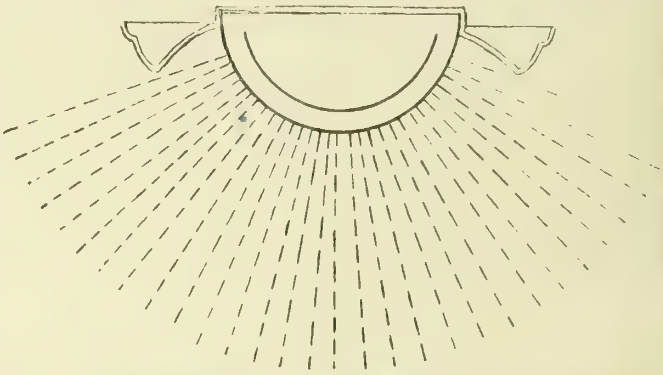
This improved distribution is the objective of the Richmond Company in developing their new fire; but the lines of development have been accompanied by other gains. The old heavy proportion of convected heat and the flue heat have been the two sources from which there has been recovered by modern practice a greater proportion of heat as radiant energy; but a largely unexplored source of loss of heat which helps to swell the chimney heat is the cast-iron back of the fire. A diminution of the loss from the back of the fire would automatically produce an increment—although not an equal increment—in the radiant heat emitted by the fire. The reduction of this source of loss is therefore a matter of structural revision; and this revision is accomplished, and a decreased area of back casting obtained, by the new "R.H.D." fire of the Richmond Company, with its semi-circular front, for which construction as a whole patent protection has been applied for. When it is mentioned that the area of the back brick, and the amount of rear heat loss have been reduced by 33 per cent., it will be admitted that something has been achieved here. The radiant efficiency of the Richmond fires has been up to the best of standards for many years; and an improvement has now been effected by this means, and, as will be seen later, by the use of nickel reflectors, which prevent the absorption of a certain proportion of heat by the adjacent cast-iron work. The firm assert that, as a matter of fact, the new fire has a radiant efficiency very much greater than any of its predecessors, high as has been the standard to which they have worked.

Other Structural Features.

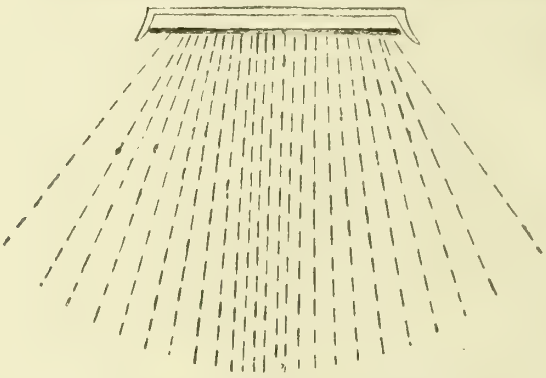
Among other structural points of the "R.H.D." fire, it may be mentioned that the special half-circle burner is fitted with the firm's patent gas and air adjuster, which, under all ordinary conditions, ensures silence in burning. Although this adjuster has been described before, readers may be reminded that the injector has been designed so that the gas flows out from the jet at a number of points on the circumference of a circle, and thus gives a cylindrical stream of gas, which, as it passes into the burner tube, steadily expands. The head of the controlling spindle, which is about $\frac{3}{8}$ inch in length, is provided with a number of carefully cut and graded serrations. The spindle works in a collar of definite length; and, by screwing it forward, the gas supply may be gradually shut off. Thus, it will be seen that, prior to its exit from the fitting, the gas passes down a number of short tubes, and in this way all objectionable eddy currents in the stream of gas are eliminated, and consequently noise. By suitable adjustment of the various parts of the fitting, the velocity of the issuing gases is reduced sufficiently to prevent the formation of the eddy currents; and yet there is induced sufficient primary air into the burner by means of the gas stream to enable the fitting to work satisfactorily at the varying pressures, and with the varying composition, of gas supplied in different towns. The semi-circular fire-brick back has a cavity in it forming an air pad, as has been the practice of the firm of late with their ordinary fires.

Another structural point is that, in the construction of the canopy and flue, Richmond's well-known "ledge" principle has been applied.

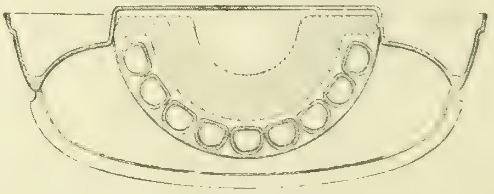
A further feature is that the fire is fitted with nickel reflectors at each side on the fender, and on the ledge of the canopy. The purpose of these is satisfactorily accomplished. It is to prevent the absorption of heat from the radiants by the extreme sides and canopy of the fire, and deflect it out into the room. We are assured that the nickel used is non-oxidizable, and will not deteriorate; and that it is capable of reflecting 90 per cent. of the infra-red radiation. The firm direct special attention to the reflector on the canopy ledge. The radiant heat from the fuel hitherto absorbed by the cast-iron canopy must be an appreciable amount; and this passes away as flue loss and as convected heat. The reflectors prevent the canopy from becoming a means of drawing-off heat by absorption and dispersion; and so in this way radiant efficiency is again subserved by the structural arrangements. Indeed, the reflectors have a triple advantage. There is the one just mentioned. Then, when the fire is alight, the reflectors considerably enhance the appearance of the fire by the optical effect produced of a large increase in the radiating surface. When not in use, the polished reflectors add to the appearance of the stove—being both an ornament and a refinement.



Representing the Distribution of Heat emitted by the Semi-Circular Fire.



Representing the Distribution of Heat emitted by a Flat-Fronted Fire.



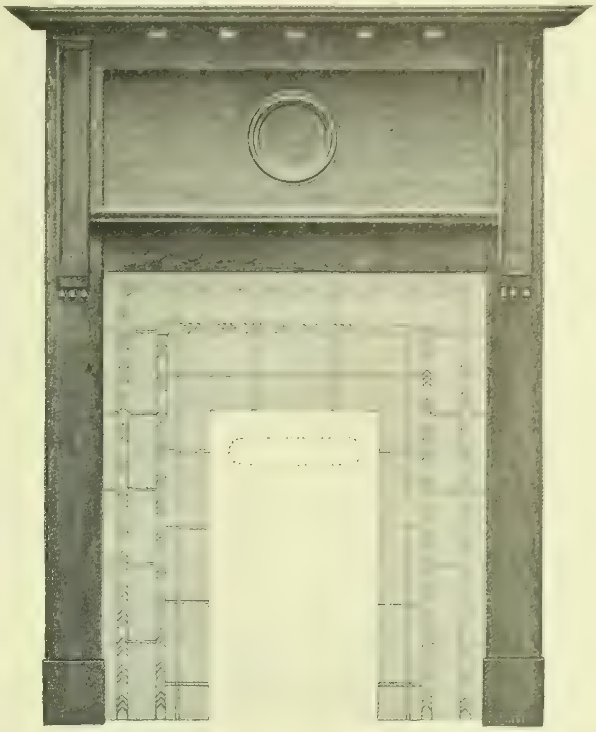
Showing the Reduced Area of the Back Brick compared with the Radiating Surface.

Diffused Ventilation.

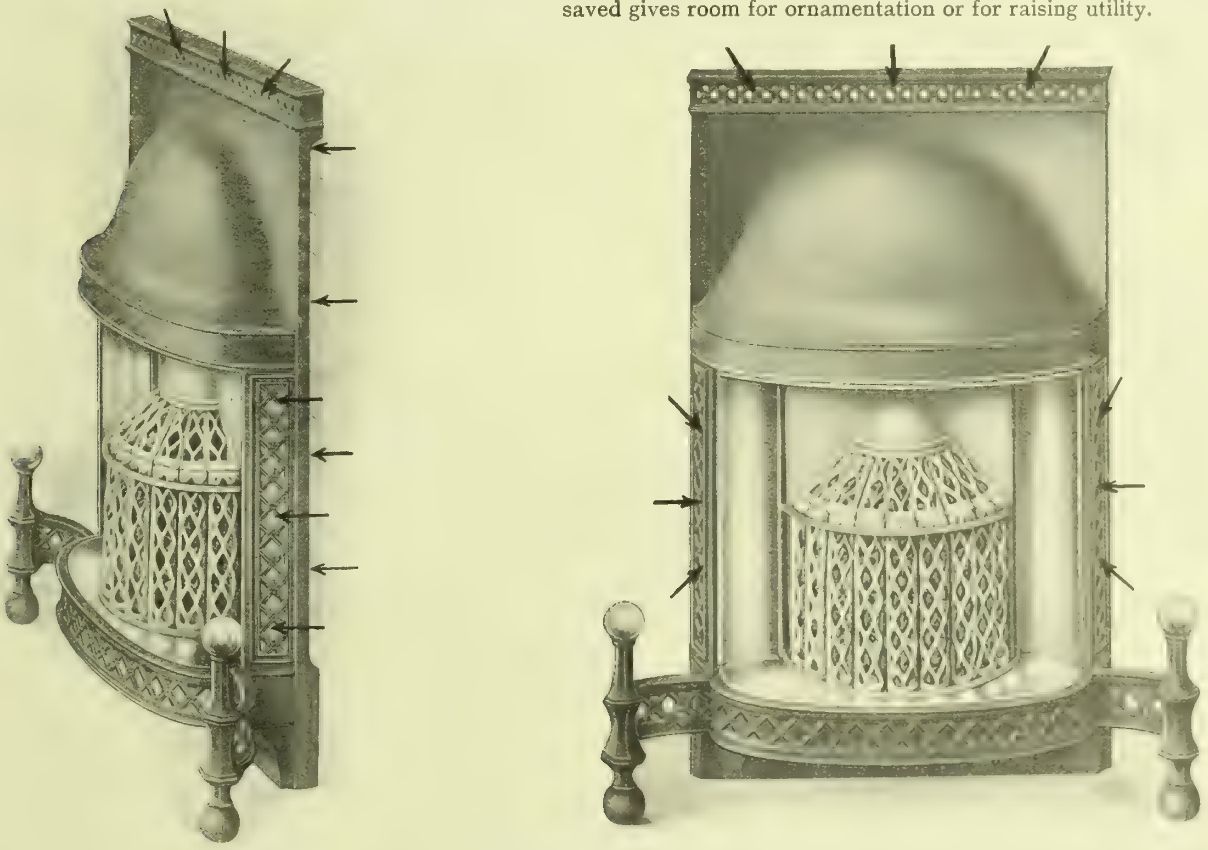
While no one pretends that a gas-fire alone provides adequate ventilation for a room, it is a considerable aid to the changing of the atmosphere, and, as it happens, at the period of the year when rooms are more freely occupied than at other seasons, and when there is a proneness to keep doors and windows tightly closed. The Richmond Gas Stove and Meter Company have been giving attention to the subject of improving their fires as means of ventilation. In dealing with the raising of the ventilating capacity of their fires, they inform us that they have acted on the same principle as in respect to radiant heat—viz., distribution and diffusion. They contend that just as it is desirable for radiation to be distributed over a wide area, so it is desirable for the room air to be drawn for ventilation from a wide area—in other words, it is their view that a single stream or current of air drawn from one position and passed through a restricted orifice is akin in principle to the flat-fronted fire giving all its radiant heat to a limited area. Of course, this is a point that is open to controversy, seeing that radiations are confined to straight lines; while where there is rapid withdrawal of air from a room, fresh air must be finding inlet at various points, and so the air of the room is not by any means stationary. However, this does not detract from the principle that numerous air-ports must be an advantage, if only their provision is not detrimental in any other way. That the new fire does provide numerous air-ports through which air constantly streams is shown by one of the accompanying illustrations. The points of advantage submitted are: The air change is ample; the air-ports having been made to suit the usual area of the chimney shaft. Further, the air is entirely drawn through the cooler parts of the iron frame of the stove, and not the hottest portions—cool parts which are protected from the heat by the nickel reflectors previously described. Where the fire is fixed in front of a standard coal grate, it is apparent how the ventilation is effected. Where it is desired to build-in the fire, or fix it flat against the tiled slab, one of the photographic reproductions shows how the firm recommend it should be fitted. The large open space left in the tiling is the same as, or greater than, the area of the chimney outlet. It is obviously unnecessary, and it is a waste, to tile the area covered by the back of the fire. The spacing of the air-ports, it is pointed out, avoids any excessive "pulling" in one direction; and it also ensures that cold draughts will not be produced to interfere with the comfort of the occupants of the room.

IMPRESSIONS.

We have inspected a sample of the fire; and the first impression is that the design has been admirably chosen to enable the ventilating to be accomplished without in any way detracting from the artistic appearance of the fire. The fire is of "Chippendale" design, and is in harmony with the firm's popular "Period" series of fires. It is something quite out of the ordinary rut. At whatever point one is sitting—a distance away at the side of the fire, or right in front—one looks at a solid cheerful incandescent fire. One cannot get the same effect with a straight faced fire, with which only the persons who sit quite in front realize the full effect. But this fire distributes its benefits and its comfort equably, without reference to the position occupied by a person. There are, too, compactness and finish about the fire, which are pleasing features. But words only inadequately describe visual presentment. The illustrations do this much better; and there can only be one result of their examination—appreciation of this branching-out into a new line of construction, with its accompanying merits. Another impression is that the fire will have a large adaptability for all sizes of rooms; seeing that, although the accommodation may be limited for the installation, a powerful fire can be supplied under this form of construction. We have spoken of the narrow fire back. The fire-brick back of the fire inspected did not appear to be any greater than one would have in an ordinary 10-inch fire, and yet, if the radiants in the fire were placed in a straight line, they would give a surface equal to what one would get were the fire (say) 14 inches wide. The space saved gives room for ornamentation or for raising utility.



Showing Opening in Tiled Back, as Recommended to Secure Ventilation.



SIDE AND FRONT VIEWS OF THE FIRE, SHOWING THE NUMEROUS AIR-PORTS FOR VENTILATION.

There is just one point about the name—the "R.H.D." fire. It has a double appropriateness. The three letters give us the initial letter and the final letters of the two syllables of the firm's name (RicHmonD). The three letters are also the initials of the three words constituting the full name with which the fire has been endowed, and which it clearly merits—the "Radiant Heat Distributor."

WESTON-SUPER-MARE NEW GAS-WORKS.

To cope with ever-increasing business, the plant of the Weston-super-Mare Gaslight Company has been altered, extended, and renewed many times. In 1904-5, in order to provide additional manufacturing plant, consideration was given by the Directors and the then Manager, Mr. J. H. Gray (who has since retired, and was succeeded only this year by Mr. James Taylor, of Mossley), to the process for the production of carburetted water gas, and plant was installed which has been in operation ever since with considerable benefit to the Company. The output continued to grow; and in 1911 the Board approached Messrs. Corbet Woodall and Son, of Westminster, and asked them to report upon the question of adopting improved machinery at the works, and for a scheme to provide for the development of the works rendered necessary by the large annual increase in the demand for gas. As a result of their advice, the Board decided to provide an entirely new works in order to obtain the fullest possible benefit from the adoption of modern machinery, working under suitably arranged conditions. It was found that any scheme of reconstruction of the old works would have to be of the most drastic character; and the expense involved would not be justified by the results which could be obtained. Land adjoining the existing works was purchased; and sufficient area was provided to be ample for any developments during the next fifty years. The total area of the land on which the works are situated amounts to 15½ acres, all of which is the freehold property of the Company. The following particulars of both the old and the new works are taken from a descriptive pamphlet which has been prepared for distribution among the proprietors.

VIEW OF THE NEW WORKS FROM THE WEST.

THE OLD WORKS.

These works consisted of three retort-houses with adjacent coal-stores, air-cooled condensers, exhausters, washers, purifiers, &c.; the whole being capable of producing 732,000 cubic feet of coal gas per 24 hours. The retort-settings in the two smaller retort-houses are being demolished; but the larger house, which is capable of producing 448,000 cubic feet per day, together with the necessary condensing, washing, purifying, &c., plant, is at present being retained in working condition. The whole of the retorts were contained in direct-fired settings, operated by manual labour. All coal used was carted from a short private railway siding inside the works to the coal-stores or retort-houses.

The carburetted water-gas plant consists of two sets of generators, carburettors, superheaters, &c., and is capable of a maximum daily production of 700,000 cubic feet of gas. The gas-making vessels are used alternately; one set always being in reserve for stand-by purposes.

The present sulphate of ammonia plant was installed 23 years ago, and is now quite inadequate for dealing with the increased production of ammoniacal liquor. Plant capable of producing 3 tons of sulphate of ammonia per day is on order, and will replace the existing plant in the course of a few weeks.

There are five gasholders; the total storage available for distribution being 1,898,300 cubic feet.

The governor-house contains two 18-inch station-governors, which are of the compensating type, and are water-loaded. These are used for regulating the pressure of gas given by the gasholders to the amounts requisite for the supply to the district mains. A "safety" governor is also provided to guard against any failure of supply to the town due to inadvertence or negligence of the attendants in the regulation of the gasholder valves.

THE NEW WORKS.

Messrs. Corbet Woodall and Son were engaged as Consulting Engineers, and instructed to prepare a scheme for the new works. The scheme provided for works capable of producing 1 million cubic feet of coal gas per day, with provision for extensions which would increase the total output to 2 millions. Much of the plant provided for would, in fact, be suitable for the larger output which the Consulting Engineers had in mind; and, therefore, the additional capacity could be obtained for a comparatively low outlay. Plans for utilizing the remaining land were also considered, so that still further extensions might be conveniently made should they be needed at a future time.

The site proved to be a somewhat difficult one for the exacting requirements of a modern gas-making plant, as, in addition to the surface of the ground having to be raised all over the site by about 3 feet, necessitating thousands of loads of filling material being used, special care had to be taken to provide satisfactory foundations for the great weights of some of the structures.

Gas was first made at the new works on June 8 of this year; and the old and new works were operated together until June 16, when the old works were closed-down. All the coal gas required since that date has been provided from the new works.

Railway Siding.

For the conveyance of coal and other materials, a line of railway is laid from the old works, connecting with the Great Western Railway system; the total length of this siding being 465 yards. At present the railway waggons are hauled to and fro by horses; but as soon as the amount of traffic will warrant the expense, mechanical haulage will be substituted.

Coal-Handling Plant.

The coal-waggons, on arrival at the new works, are emptied into a receiving hopper placed underneath the rails, from which hopper the coal is automatically fed into a gravity bucket conveyor. This conveyor has two changes of direction, and is fitted with a tipping device which empties the load from the buckets into a jig feed to a coal-breaker. The breaker is of the four-roll type, with massive claw breaking-rolls, which are arranged to break the coal into pieces not exceeding 2 inches cube. The small coal which does not require breaking is allowed to fall down a bye-pass shoot, without going through the breaker.

From the breaker the coal is fed to the boot of a steel bucket elevator, and by it is carried to the top of the retort-house and delivered on to a push-plate conveyor. This latter is carried the length of the retort-house over a range of hoppers, and coal is delivered by the conveyor to any of the hoppers, as required, through slide doors. The holding capacity of the hoppers is 100 tons of coal.

The whole of the coal-handling plant is designed for dealing with 25 tons of coal per hour; and sufficient coal can therefore be dealt with during the day time for the requirements of the night.

Coal-Store.

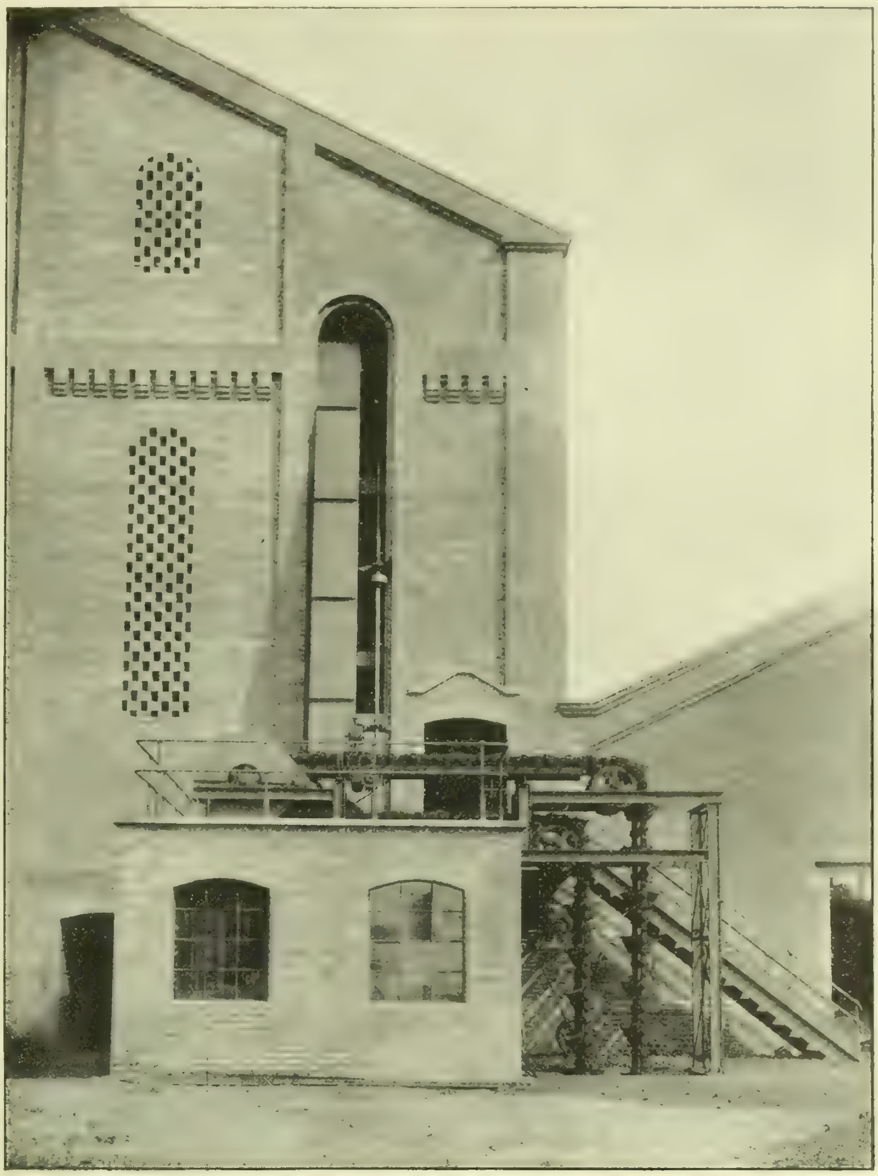
The bulk of the coal received is dealt with by the mechanical arrangements mentioned above; but on account of the unavoidable fluctuations between supplies and requirements, a coal-store is provided, and coal can be emptied into it direct from the railway waggons. The capacity of the store is 1400 tons.

Retort-House.

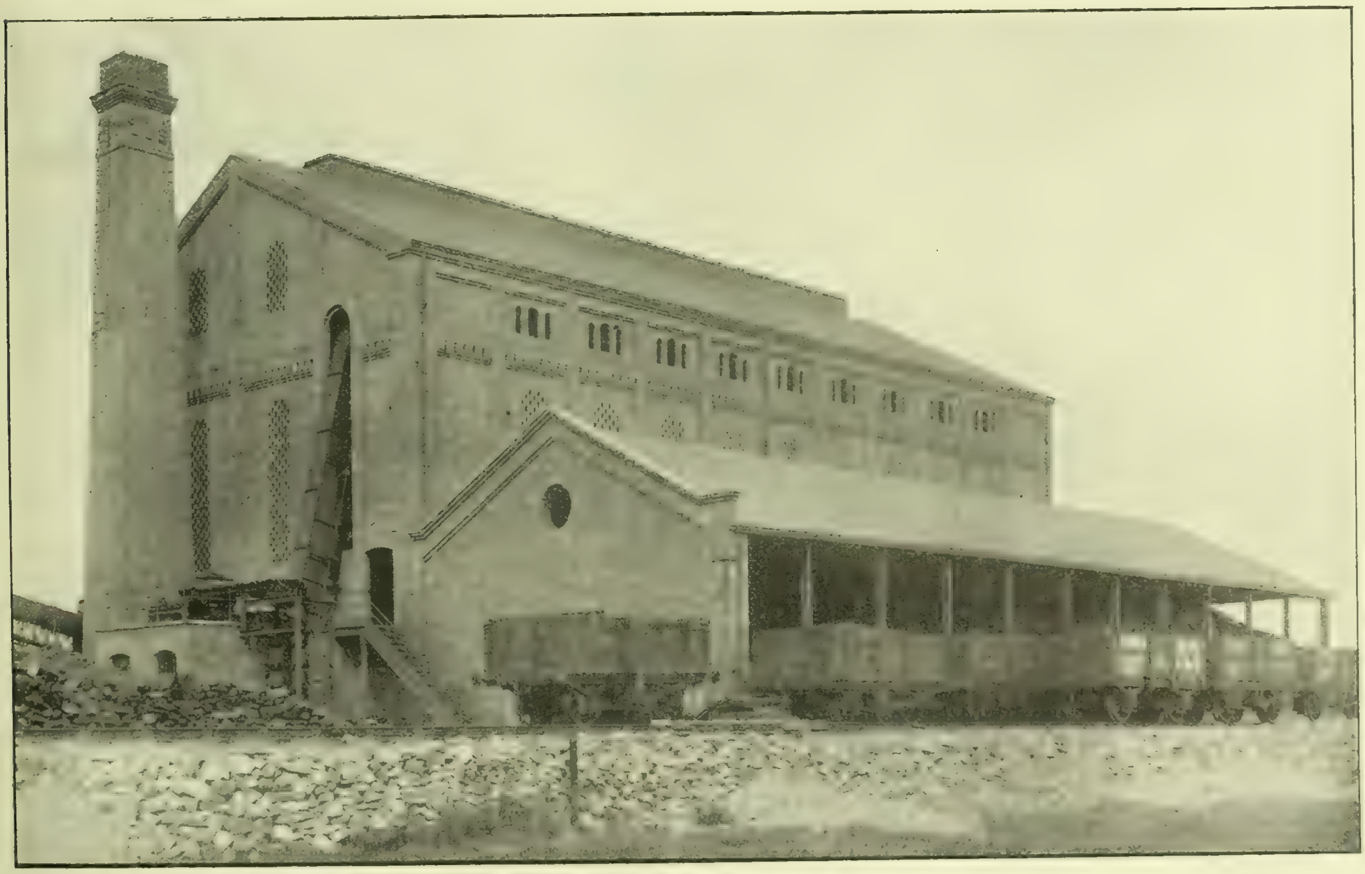
The retort-house is a steel framed building filled in with brickwork, and is 108 ft. 6 in. long by 60 ft. wide by 46 ft. high. Owing to the great weight which had to be carried in connection with this building, an elaborate system of concrete piles and concrete raft foundation was designed and provided to overcome the inherent weakness of the site for bearing capacity. The building has been so designed as to be readily capable of extension when required.

The retort-stack consists of eight settings of horizontal retorts, each setting containing eight retorts, 24 in. by 16 in. (⌓ section) by 20 ft. long. The retorts are of moulded fire-clay, and are heated by deep regenerator furnaces, which give command of a high range of temperatures with a low consumption of fuel.

The work of charging and discharging the retorts is performed by a Fiddes-Aldridge simultaneous discharging - charger, which ejects the coke from the retort by a ram, and



COAL CONVEYOR AND ELEVATOR.



THE NEW RETORT-HOUSE AND COAL-STORE.

APPARATUS ROOM, SHOWING THE TAR-WASHER.

at the same time deposits a fresh charge of coal in the retort. The combined operation is effected in the short space of 35 seconds; and the weight of material dealt with in that time is from 17 to 19 cwt. The necessary supplies of coal are obtained automatically from the overhead coal-hoppers during the travel of the machine on tram-rails laid in front of the retort-bench.

The stoking machine is driven by electricity, produced at low cost by the Company's own generating plant, and has all the necessary travelling, hoisting, and lowering motions in addition to the charging and discharging mechanism. Although somewhat complex at first sight, the machine is quite easy to operate, and, considering the duties required of it, is an exceedingly simple and reliable piece of mechanism.

The red-hot coke, when discharged from the retorts by the stoking machine, falls into the trough of a coke-conveyor situated in the floor of the retort-house, on the opposite side of the bench to the stoking machine. The coke is drawn by the conveyor under a number of water sprays for quenching purposes, and is finally delivered on to the coke-heap outside the house. The total length of the coke-conveyor is 210 feet, of which 105 feet is outside the retort-house. By means of openings in the trough of the conveyor, to which doors are fitted, the coal can be delivered at any of the thirteen points, as desired. The coal and coke handling plants are driven by vertical steam-engines fixed in small engine-rooms in the retort-house cellar.

The retort-stack is fitted with ascension-pipes, hydraulic-mains, tar-mains, &c., on the stoking-machine side of the stack only. A tar-tower and retort-house governor are provided. From the hydraulic-mains, the foul main is carried along two sides of the retort-house, and thence underground, returning parallel to the retort-house to the condensers. These are of the vertical water-cooled type, and consist of two towers which may be worked separately or together, as necessary. They are purposely fixed on the north side of the retort-house, so as to be shaded from the direct rays of the mid-day sun, which would otherwise interfere with the efficient control of the plant.

Apparatus House.

The exhausters, fixed in the apparatus house, are provided in duplicate, one set being always in reserve for stand-by purposes; and they are of the two-blade rotary type, direct driven by horizontal steam-engines.

The engine-room contains an electric generating plant for providing the electric current used for the driving of the stoking machine. There is also the necessary battery of gas pressure-gauges, jet photometers, and a recording calorimeter, for the observation and registration of the quality of the gas as manufactured and as delivered to the district for consumption.

In the room adjoining the engine-room is a Livesey washer for the elimination of tar and some of the ammonia impurities contained in the gas at this stage. The remainder of the ammonia is removed by a vertical centrifugal washer-scrubber outside the room, driven by a vertical steam-engine fixed inside the room. Sufficient space has been left in the buildings for additional apparatus which will be needed for future requirements.

The steam required throughout the works is supplied by two Lancashire boilers, each 26 ft. 6 in. long and 6 ft. 6 in. diameter, suitable for a maximum steam pressure of 100 lbs. per square inch. The boilers are fully equipped with feed pump, injectors, &c., and also special furnaces for the combustion of low-grade fuel.

The water supply for other than drinking purposes is obtained from a pond in the Royal Potteries ground. Owing to its hardness, a water-softening plant is provided to overcome the disadvantages attending the use of hard water in the steam-boilers. Tests which have been made show a reduction by the plant from 40° of hardness to 2° to 5° of hardness, by Clark's test.

After leaving the apparatus buildings, the gas is next treated for the elimination of a highly important constituent required for the manufacture of explosives. The necessary apparatus has been contrived out of disused plant brought from the old works. The importance of this process is shown by the fact that the explosive constituent required for the firing of forty to eighty shells per day is being, and will be, produced by the Company.

Purifiers.

Four purifiers are provided, each being 25 ft. by 20 ft. by 5 ft. deep. They are of the luteless pattern, with two covers to each; the joint between the cover and the vessel being made gas-tight by means of india-rubber packing.

Very efficient and satisfactory purification is being obtained from the plant, and at the same time the working costs promise to show a considerable reduction on the cost of purification at the old works.

Meter-House.

The last piece of apparatus in connection with the new works is the station-meter, which is of 80,000 cubic feet per hour capacity, and therefore capable of dealing with twice the amount of gas the works are at present able to produce.

Distribution Workshops and Stores.

The workshops and stores for the distribution section were erected in 1913, and made a handsome addition to the Company's property. Although of considerable extent, the various rooms and buildings are fully occupied, owing to the extraordinary development during the past few years in the Company's business in the sale and hire of gas appliances. The popularity of gas cooking (there are 4455 gas-cookers in the area of supply) has rendered necessary the installation of several modern machines, forming a power plant for the more economical and satisfactory cleaning and renovating of these articles. Though this plant has been at work for a few weeks only, the results already attained are highly satisfactory, and the saving in labour costs considerable. In addition to the usual workshop appliances, a complete plant for the testing of gas-meters is installed.

GAS AND HYGIENE.

By Dr. M. von Gruber, Professor at, and Director of, the Hygienic Institute of Munich University.

The lecture which Professor M. von Gruber delivered at the meeting of the German Association of Gas and Water Engineers at Munich in July last year, on "Gas and Hygiene," was published in the "Journal für Gasbeleuchtung" of the 24th-31st ult. An abstract of the lecture was given in the "Journal" shortly after its delivery [*vide*, Vol. CXXVII., p. 110]; but as the work of the Professor is the first exhaustive investigation in Germany regarding the hygienic aspects of gas for lighting and heating, it will be useful to give a fuller account of it for comparison with the similar investigations which have been made by various English chemists.

Professor von Gruber opened his lecture by referring to the violent attacks made publicly in recent times on the use of gas for lighting dwelling rooms. Such use has been stated to be incompatible with hygiene, because the air is said to get charged with harmful products, while its temperature and humidity are increased to an undesirable extent. On the other hand, there have been statements—emanating chiefly from England—that gas lighting purifies the air, destroys smells, and tends to disinfect the air of rooms; that its warmth considerably improves ventilation; and that, as a consequence, the air of an occupied room which is lighted by gas is better than that of one lighted by electricity. It seemed desirable, in view of such conflicting statements, to make an exhaustive investigation of gas lighting in its bearing on the atmosphere of dwelling rooms. The German Association of Gas and Water Engineers provided the means by which the Munich Hygienic Institute was able to study the problem in a thorough manner.

The Experimental Rooms.

In the year 1904, a Committee of the German Association had investigated the question of the lighting of school rooms and drawing offices, and determined in what manner it could be carried out consistently with health requirements ["Journal," Vol. LXXXVII., p. 395]. The present investigation extended to the effect of gas lighting—in comparison with electric lighting—on the small living rooms and offices in which the bulk of the populace live from day to day.

In all such investigations change in the weather becomes a disturbing factor. Its effect was excluded as much as possible by carrying out the comparative observations and experiments simultaneously in two similar rooms—one being lighted by electricity and the other by gas. Suitable rooms for the purpose were found in Munich by Dr. E. Schilling, who, with Herr Ries, the Manager of the Gas-Works, and Dr. Schumann, who was responsible for the fitting and equipment of the rooms, greatly assisted the author in the investigation. A plan and sections of the rooms are shown in figs. 1 and 2 (p. 450). The rooms were on the third or uppermost floor of a tenement house of ordinary type, moderately well built, and in good condition. The windows faced nearly due east. The two rooms used for the investigations were of approximately the same size, each having a cubical content of 2016½ cubic feet, and both opening on to the same corridor. Between the two rooms was the laboratory, from which observations could be made, air-samples taken, &c., simultaneously on both sides. On the other side of the experimental rooms were unoccupied rooms of the same flat; and it was therefore possible to keep these rooms in precisely the same condition at any given time. The experimental rooms had practically identical ground plans, each had one window, and also one door opening on to the corridor. The doors between them and the laboratory were boarded-up, and apparatus was attached to the boarding as described later. One of the rooms originally had a third door; but this was taken out and the opening bricked-up. The actual dimensions of the rooms, as shown by the illustration are: Length, 20 ft. 3 in.; width, 10 ft.; height, 10 ft.

The stoves which were originally in the rooms were taken out and replaced by gas-fires, which were connected with the chimney; so that nothing of the products of combustion from the fires could escape into the room. Provision was made for taking the air supply—both primary and secondary—to the gas-fires, either from the corridor in order to leave the air of the room unaffected by the air required for heating, or from the room, in which case the fires contributed to its ventilation. Both rooms were similarly equipped with three inverted Graetzin burners, consuming 1·41 to 1·48 cubic feet of gas per hour at 22-10ths to 25-10ths pressure, and three electric metallic filament lamps. The lights were chosen to give the same illumination on the surface of the writing table. It was intended that this should be not less than 25 metre-Hefners; but actually each source of light afforded an illumination of from 40 to 50 Hefners, which is well in excess of hygienic requirements. A fan for mixing the air when required, controlled from the laboratory, was placed near the ceiling in each room. The gas-burners were ignited by the "Multiplex" self-lighting device. The rooms were not entered by anyone throughout an experiment. Windows were provided in the boarding of the doorway, through which observation on the rooms could be kept from the laboratory.

One room was provided, in order that it could be freely ventilated, with a ventilating fan in the window and a ventilating pipe in the angle of the ceiling above the stove. This pipe, which was about 10 inches wide, extended above the loft which was over the experimental rooms, and could be left open or closed tight as desired. In this room each of the walls was penetrated by three small tubes, which could be kept closed or could be connected with a differential pressure gauge, which enabled some very interesting results to be secured in regard to the distribution of pressure at the boundary walls of the room. The loft above the rooms was without partitions; so that in this respect both the experimental rooms were under identical conditions. Both rooms had a good oak flooring, which cut them off almost wholly from the air of the rooms on the floor below. There were a number of communicating pipes, by which air could be drawn from the experimental rooms, or apparatus introduced into them. One pipe, about 2 inches in diameter, open at both ends, but closed at will, extended well into the room, to allow of the mean temperature and mean humidity of the air being observed by means of an Assmann ventilating hygrometer, or for withdrawing air for respiration trials, or introducing carbonic acid from a cylinder. There were also fifteen narrow pipes passing through the boarding to different points of each experimental room, which made it possible to take samples of air from points at three different levels for the determination of carbonic acid, with a view to ascertaining its distribution in the air of the room. At the same points from which these air samples were drawn, there were placed carefully standardized resistance thermometers, all in connection with a single switch-board in the laboratory. The temperature distribution in each room could thus be observed at any time. In the laboratory there were also separate electricity meters, gas-meters, and pressure gauges for each room, as well as a Zuntz respiration apparatus.

The investigations assumed that the room might be used either as a living room, with the family sitting round a table lighted by a single lamp, or as an office with at the most three double desks or writing tables. Some tests were therefore carried out with the rooms lighted by one, two, and three lamps, either gas or electric. They were purposely made in as unfavourable weather conditions as possible—some in the summer and early autumn, but the greater part on warm days in the winter, when there was little wind and ventilation was therefore poor. Most of the tests lasted six to seven hours, some longer; thus corresponding with the winter's evening period of artificial lighting in lower-class households. Most of the investigations, comprising thousands of measurements and observations, were carried out by Dr. Hermann Ilzhöfer, the Assistant at the Hygienic Institute.

Chemical Changes in the Air.

A single direct test only was made for sulphurous acid in the air of the room. In this test 80 cubic feet of gas were burnt in 18 hours, and the air was drawn through standard solution of iodine. With 10 litres of air no trace of sulphurous acid could be detected. This result agrees with expectation, seeing that coal gas contains from 11 to 52 grains of sulphur per 100 cubic feet, which volume, on combustion, would yield about 57 cubic feet of carbonic acid and only 0·018 to 0·084 cubic foot of sulphur dioxide. Thus for each volume of carbon dioxide there could be produced at the most 0·0015 volume of sulphur dioxide. Consequently, only traces of sulphur dioxide due to gas consumption could possibly be detected in the air.

A large number of tests were made for carbonic oxide in the air, mostly by the blood test, which is exceptionally sensitive, and is of great hygienic importance. Obviously carbonic oxide can only give rise to injurious effects if there is an appreciable absorption of it in the blood, as only in that case would the supply of oxygen to the system be endangered. The blood test did not give a positive result in any instance. Neither could carbonic oxide be detected by the iodine pentoxide method. Even when more than 350 cubic feet of gas were burnt in 67 hours in the experimental room, no carbonic oxide could be detected in four litres of the air of the room. This test would show results higher than the real proportion of carbonic oxide, because iodine pentoxide is acted upon by various hydrocarbons as well as by carbonic oxide. Some recent investigations by Dr. Terres [*vide* "Journal," Vol. CXXVII., p. 109] have shown that the extreme proportion of carbonic oxide which could have been produced in the lighting conditions of the experimental room would be of no importance. The maximum increase realized in the experiments in the carbonic acid in the air of the room when regarded as a living room, was 44 volumes per 10,000, which, according to Dr. Terres, would correspond with a maximum of 0·156 volume of carbonic oxide per 10,000. This is a proportion which breathing tests have shown to be quite harmless to the system.

A number of tests were made on the proportion of nitrogen oxides in the air of the room when lighted by gas. The greater part were merely qualitative tests with indol, and in no case was nitric oxide detected. Some quantitative tests were made by the method of Haber and Coates. In an extreme case, in which four inverted burners consuming not less than 2·8 cubic feet per hour were kept burning for 42 hours, the proportion of carbonic acid reached by the end of the test was 138 volumes per 10,000, and the proportion of nitrogen oxides, reckoned as nitric oxide, was then 0·104 volume per 10,000 volumes of air. These figures agree well with the ratio between carbonic acid and nitric oxide observed by Dr. Terres in his investigation of the products of combustion of coal gas. The presence of nitric oxide is not necessarily prejudicial, because the oxides of nitrogen, when highly

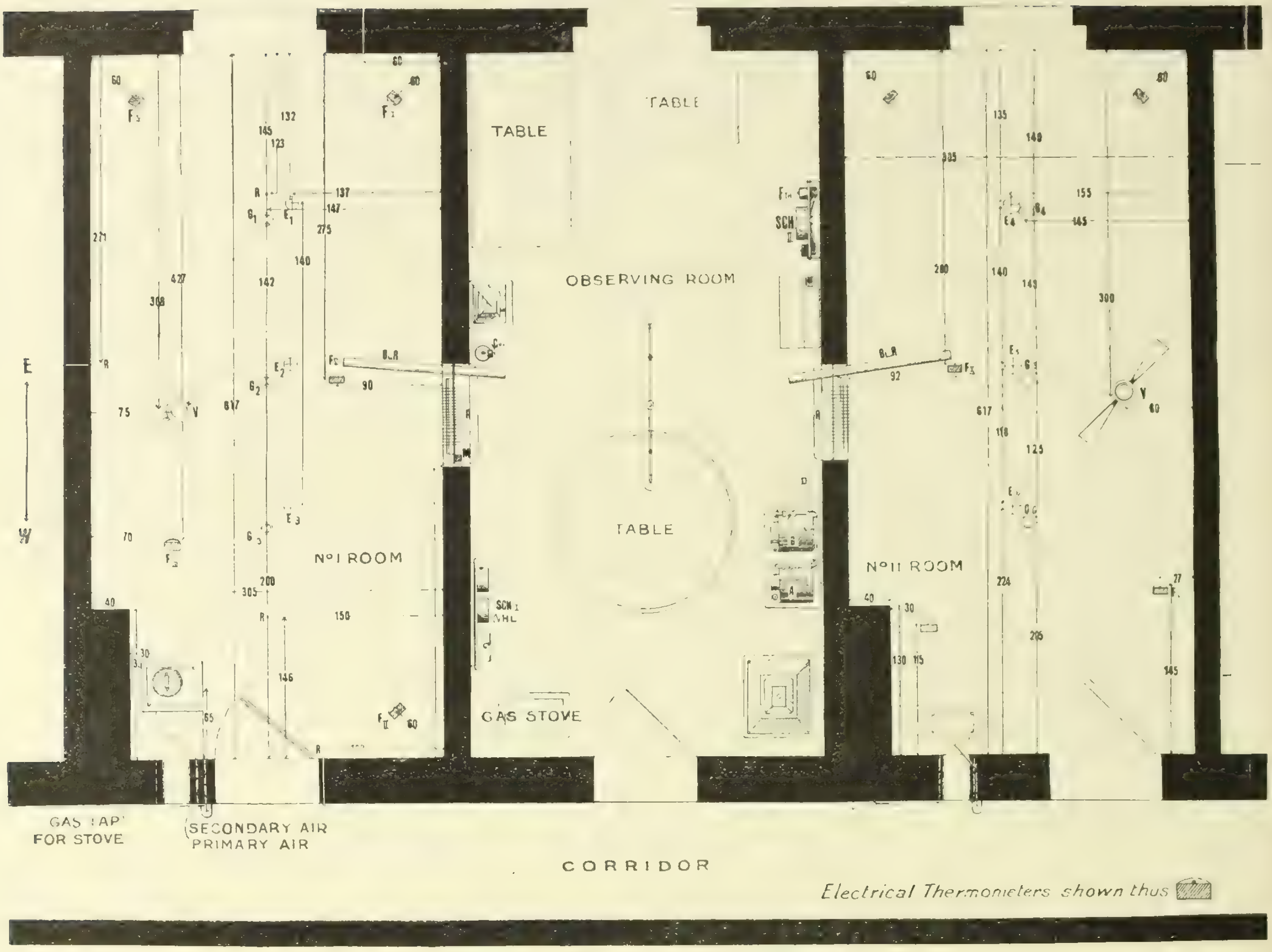


Fig. 1.—PLAN OF THE ROOM USED.

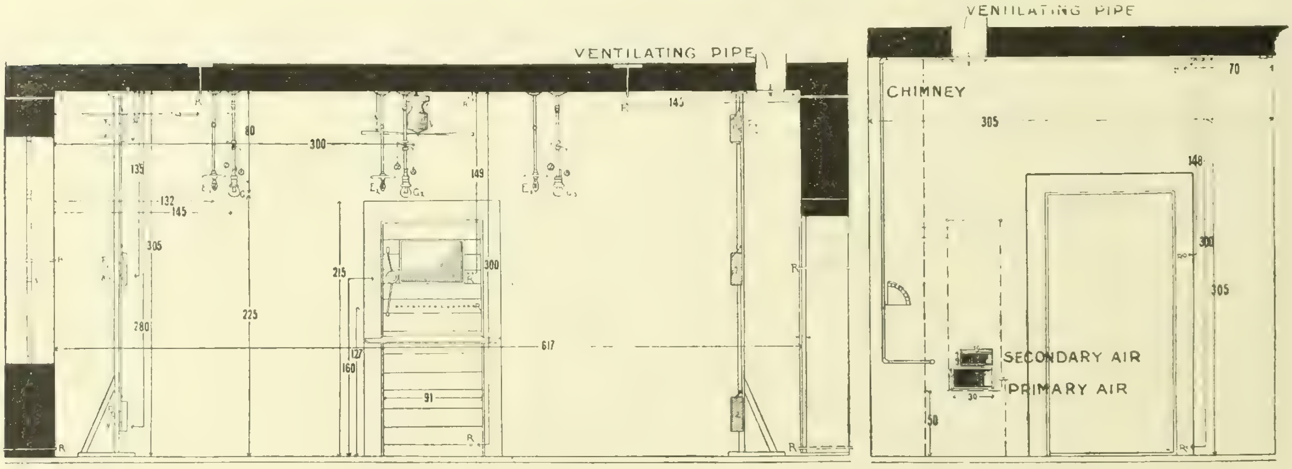
[Distances marked in Centimetres—30·48 cms. = 1 foot.]

References.

G$_1$ = Gas lights.
E$_1$ = Electric lights.
V = Fans.
M = Multiplex gas igniter.
Bl.R = Metal pipes.
R = Pipes through ceiling and walls.
SCH I. = Switchboard for fans.
,, ,, electric lights.
,, ,, electric heaters.

Fth. SCH II. = Switchboard for electrical thermometers.
Electrical thermometers I. = 1, 6, 11
,, ,, II. = 2, 7, 12
,, ,, III. = 3, 8, 13 No. I. Room.
,, ,, IV. = 4, 9, 14
,, ,, V. = 5, 10, 15
,, ,, VI. = 16, 21, 26
,, ,, VII. = 17, 22, 27
,, ,, VIII. = 18, 23, 28 No. II. Room.
,, ,, IX. = 19, 24, 29
,, ,, X. = 20, 25, 30

A = Gas meter for No. I. Room.
B = Gas meter for No. II. Room.
D = Registering pressure gauge.



Longitudinal Section.

Corridor End.

FIG. 2.—SECTIONS OF No. 1 ROOM.

[Distances marked in Centimetres—30·48 cms. = 1 foot.]

diluted, act beneficially on the mucous membrane. The trifling quantity—viz., 0·066 volume—of nitric oxide in 10,000 volumes of air, which corresponds with the maximum of 44 volumes of carbonic acid per 10,000 found in the experimental room when used in living room conditions, is, moreover, not of the least hygienic importance.

A couple of tests were made for the presence in the air of the gas-lighted room of soot or dust singed by the flame. After 21·2 cubic feet of gas had been burnt in one room in 49 hours, 500 litres of the air were sucked through a paper filter, and the same quantity from the air of the electrically lighted room through a similar filter. On comparison, the former paper was found to be somewhat darker and smoky; but the amount of impurity thus indicated was quite insignificant. It was noticed on entering the room, after it had been lighted by gas for six or seven hours, that there was the well-known smell, peculiar to gas lighting, which is difficult to describe, is somewhat choking, but after a few breaths have been taken is not noticeable. It does not appear to be of the smallest significance; and its origin seems not to have been traced.

Production and Effect of Carbonic Acid.

In the examination of the air of the gas-lighted room attention was chiefly given to the proportion of carbonic acid. To a small extent the determinations of carbonic acid were made by the Pettenkofer tube method, which gives average values; but the greater part of the tests were made with Haldane's apparatus. The author believes that this is the first instance of the use on a considerable scale in Germany of this apparatus, which he can most cordially recommend. A few details of manipulation have to be learned, and then the proportion of carbonic acid in parts per 10,000 can be ascertained with it extremely rapidly and conveniently, with an accuracy of one part in 10,000. The room was in all cases thoroughly ventilated at the outset of a test; and the carbonic acid contained in the air then was generally found to be 4 parts per 10,000. This was deducted from the amount of carbonic acid found at any subsequent hour in the course of the test in order to show the increase in the proportion of carbonic acid. Table I. gives a summary of the results obtained in a number of tests, in which the room was lighted first with one gas-burner, then with two, and then with three burners.

Table I.—*Effect of Gas Lighting on the Temperature, Humidity, and Carbonic Acid Content of the Air of a Room.*

No. of Tests Made.	No. of Burners in Use.	Illumination of the Table or Tables.	Duration of Each Test.	Increase of Temperature During the Test.			Relative Humidity at End of Test.	Change of Humidity During Test. Per Cent.			Carbonic Acid in Air at End of Test.	Increase of Carbonic Acid During Test. Parts per 10,000.			Ventilation. Cubic Feet per Hour		
				Maximum.	Minimum.	Mean.		Maximum.	Minimum.	Mean.	Parts per 10,000	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
		Lux.	Hours.	Fahr	° Fahr.	° Fahr.	Per Cent.										
6	1	45 to 50	6 to 7	5·4	1·5	3·7	34 to 59	+ 6	- 1	+ 1·8	8·5 to 15·0	10·3	3·6	7·19	2782	1063	1666
14	2	31 to 51·5	4 to 7	4·9	0·7	2·7	33 to 86	+ 17	− 3	+ 3·7	13 9 to 38·5	25·5	9·1	16·00	2302	321	1285
13	3	35 to 58	6½ to 9	7·9	2·3	5·6	49 to 79	+ 12	− 6	+ 6·2	22·5 to 44·0	39·15	17·25	27·22	1769	681	1251

It will be seen that with one burner consuming about 1·48 cubic feet of gas per hour, and giving an illumination on the table of about 50 metre-hefners, the increase in the proportion of carbonic acid has not exceeded 10·3 parts per 10,000. In the tests with two burners, the maximum increase in the carbonic acid was 25·5, and with three burners the maximum increase was 39·15 parts per 10,000. It should be pointed out that the proportion of carbonic acid in a lighted room, like temperature and humidity, does not continue to rise to an unlimited extent, as would be the case if the room were hermetically sealed. Dwelling rooms, however, have walls which are permeable in a very high degree; and in a comparatively short time a point is reached at which the proportion of carbonic acid remains stationary, owing to the ventilation through the walls. A large number of tests were made, in which the proportion of carbonic acid was determined every hour; and the results showed that this stationary position or maximum was attained in a comparatively short time—viz., within five to six hours. The same thing occurs in regard to the temperature of the room, which rose only by a few tenths of a degree in the later hours of each test.

The distribution of carbonic acid in the air of the room, as ascertained from analyses of samples taken simultaneously at fifteen places in the room, presents an interesting study. Thus, in seven tests, in four of which one burner was used, in two, two burners, and in one, three burners, the proportion of carbonic acid at the floor level averaged 12·5 parts per 10,000; at the breathing level, 15·6 parts; at the ceiling, 17·6 parts. The mean proportion of carbonic acid at the breathing level was found to correspond almost exactly with the average of the carbonic acid content of the whole room. As a fact the differences between the proportions of carbonic acid at the floor and breathing levels and at the ceiling are trifling when regarded as absolute values instead of as percentages, which is the way in which they should be considered from the hygienic standpoint. This controverts the contention that with gas lighting the rise of temperature increases the ventilation through the ceiling to such an extent that the products of combustion never reach the breathing level of occupants of the room. This is not the case to any appreciable extent, as in quite small rooms the currents of air due to differences of temperature between the floor, walls, and ceiling constantly effect a thorough mixing of the air. This alleged advantage of gas lighting thus does not exist.

Physiological Effect of Products from Gas-Burners.

Special attention was given to determining the physiological effect of air contaminated with the products of combustion of gas. These tests were specially important, as the most serious attacks on gas lighting in recent times have depended on this question. These attacks occur especially in the writings of Wolpert—a popular scribbler of articles of a more or less scientific character in various newspapers. He assumes that air contaminated to a very small extent by the products of combustion diminishes the evolution of carbonic acid and the absorption of oxygen by the body—thus causing a certain stagnation of the metabolism of the system.

Numerous experiments have been made on three individuals. The most important result of these experiments is that it is shown that a comparatively trifling increase in the proportion of carbonic acid in the air breathed increases the volume of air breathed. This is exactly the opposite effect to that indicated by Wolpert, who states that a diminution, instead of an increase, of the volume of air breathed ensues. It should be pointed out that there are considerable difficulties in carrying out such investigations on human beings, because the human system does not work with absolute precision, but is subject to very many influences which cause fluctuations that have to be taken into account. Apart also from such irregular influences, there is often a continuous change in the course of an experiment. The experiments to be of any value must be made on persons whose muscles are completely at rest, so that their metabolism is at a minimum. In these tests the subjects reclined in an easy chair, so that they could remain for some hours without moving. All their muscles first became relaxed. Some time had to be allowed for the effect of previous activity to pass away. The results of these tests, as tabulated by the author, show clearly that with continuous breathing of ordinary air the volume breathed falls off, and only towards the close of the experimental period begins to rise again a little, probably because the subject becomes restless. On the other hand, the breathing of air containing more carbonic acid causes a distinct increase in the volume breathed, and even towards the close of the test period the volume breathed remains higher than in the control test with ordinary air.

The results of this series of tests are summarized in Table II., in which the average volume of the breathing with normal air is taken as 100. The results show clearly that the breathing increases with the proportion of carbonic acid in the air inhaled.

Table II.—*Relation between Carbonic Acid in the Air and Volume Breathed.*

Source of Carbonic Acid and Number of Tests made.			Average Number of Volumes of Carbonic Acid per 10,000 Volumes of Air.	Mean Volume of Breathing (Normal = 100).
Cylinder.	Breathing.	Burning Gas.		
1	—	—	11·0	95·7
2	—		22·0	104·1
1	1	1	61·0	108·2
2	1		90·0	112·3
	3	2	100·5	112·0
2		4	140·8	118·8

The production of carbonic acid by individuals was then studied; and it was found that there was no question of retention of carbonic acid when the air was enriched by products of the combustion of gas, but instead a small rise in the output of carbonic acid was actually demonstrated. This was no doubt brought about through the deeper breathing causing more thorough aëration of the blood, and so diminishing its content of carbonic acid.

The results of twenty-five tests on the oxygen consumption of individuals when breathing, firstly, ordinary air and, secondly, air enriched by carbonic acid have been collected. They appear to indicate a somewhat lower oxygen consumption with the air enriched by carbonic acid; but the differences observed between tests with such air and the tests with normal air fell well within the fluctuations among tests with one class of air alone. Hence the reduced oxygen consumption cannot be regarded as proved. Many more tests would be necessary to arrive at a definite conclusion; but such tests involve a great deal of work, and are trying to the subjects of them. Absolutely no regularity is shown by the results of the tests so far made. As in the case of the tests recorded in Table II., some were made with pure carbonic acid and some with air vitiated by breathing as well as with air enriched with the products of combustion of gas.

In one test twelve persons were shut up for six hours in the room of about 2015 cubic feet cubical content. On entering the room at the end of this time the air smelt very nasty; but if breathing through the mouth only was adopted—the nose being closed by a clamp, so that nothing could be smelt—the subject received no special impression from this air, and experienced no subjective sensation which distinguished it from ordinary air. In other tests, carbonic acid from a cylinder was liberated in the experimental room. No differences could be detected between the effect of air contaminated by breathing, air enriched by pure carbonic acid, and air rendered impure by the combustion of gas. The effect observed on the volume of the breathing can thus be ascribed with certainty solely to the proportion of carbonic acid; and there is no reason to suspect that other products of combustion—such as those resulting from incomplete combustion, which enter the air of the room—have any effect on breathing.

Experiments were made to confirm Weichardt's observation that air enriched with the products of combustion of gas has no effect on the action of catalysts. Large volumes—50 litres and over—of air highly contaminated with products of combustion of gas were drawn through the solution of the catalyst; but no diminution in its activity could be detected.

Temperature Effects of Gas Lighting.

Very many observations were made on the effect of gas lighting on the temperature of the room. It will be seen from Table I. that, when one burner only was in use, the maximum rise of temperature observed was 5·4° Fahr.; with two burners, 4·9° Fahr.; and with three burners, 7·9° Fahr. These increases of temperature caused an objectionably high final temperature of the air of the room only in cases where the initial temperature had been high owing to the room having been overheated at the outset.

In regard to the distribution of temperature, the temperature at the breathing level corresponded approximately with the average temperature of the whole room after the mixing fan had been brought into use. High temperatures were rarely attained. According to the investigations of Flügge and his pupils, the temperature of 70° Fahr., accompanied by suitable humidity, must be generally regarded as the maximum desirable in a room. This point will be again referred to later. The temperatures at the ceiling, when the air was not stirred, were higher, showing increases during a test of more than 9° Fahr. These temperatures obviously have no direct bearing on the air breathed or on warming the body by conduction through the skin; but it may be assumed that the ceiling itself is at about the same temperature as the air in contact with it, and the effect of radiation from the ceiling in warming the body must be considered. For the uncovered head a temperature of 75° Fahr. may be regarded as the best temperature for ceiling radiation. In the course of the experiments a ceiling temperature as high as 82° Fahr. was once nearly attained.

Humidity Effects of Gas Lighting.

The relative humidity of the air is very important; since, in conjunction with the temperature, it becomes the determining factor in regard to keeping the body warm. Referring to the tests recorded in Table I., the relative humidity in the living room conditions [with one gas-burner only in use] remained low—*i.e.*, about 42 per cent. of saturation on the average. This is inclined towards the low side; for the humidity with such room temperatures should fall between 40 and 60 per cent. of saturation. The humidity was always 0·2 inch and sometimes over 0·4 inch of mercury below the saturation limit. The experiments have disproved the statement, which is common in much so-called scientific literature, that gas lighting increases the humidity of the air of a room to such an extent that it becomes saturated, and water condenses on the walls, making them mouldy. Contrary to this statement, it is doubtful whether the air is, in fact, sufficiently moist.

When two gas-burners were used in the experimental room, the relative humidity was appreciably higher, averaging 54 per cent. of saturation. This figure is well within the limits laid down for the permissible range. The extremes observed were 86 and 33 per cent.; the highest relative humidity occurring when the temperature of the room was low. When three gas-burners were used, a still higher relative humidity was produced; the average at the end of the tests being 68 per cent. of saturation. While many of the readings were well above the commonly accepted maximum of 60 per cent., there was in no case anything approaching saturation; and throughout the experiment a condition was never reached in which condensation would occur and water be deposited on the walls, furniture, or floor of the room. In all tests the room had been unoccupied; so that the heat and moisture produced by human beings were not added to those resulting from gas lighting. In some instances, however, when the rise of temperature was relatively greater than the production of aqueous vapour, the humidity was lower at the end of the test than at the beginning.

Comparison of Effects of Gas and Electric Lighting.

Especially interesting were the results of a series of comparative tests recorded in Table III., of the effect on the temperature and humidity of the air of gas and electric lighting—gas being used in one room and electricity in the other. The difference between the increase of temperature in the two rooms is shown to be always trifling. The gas-lighted room acquires a rather higher humidity than the electrically lighted room; but the maximum difference found was only 10 per cent. In two sets of the comparative tests the rooms were occupied by people.

Table III.—*Comparison of Effect of Gas and Electric Lighting in the Same Conditions on Temperature and Humidity of the Air of Rooms.*

Date of Tests.	Mode of Lighting and Number of Lamps.	Number of Occupants of Room	Duration of Test.	Gas Consumed.	Temperature.			Difference between Rise of Temperature with Gas and Electricity.	Relative Humidity. Per Cent of Saturation.			Difference in Increase of Humidity with Gas and Electricity.
					At Beginning.	At End.	Rise.		At Beginning.	At End.	Increase.	
			Hours.	Cubic Feet.	° Fahr.	° Fahr.	° Fahr.	° Fahr.				
1912. April 18	E2	..	4	..	51·4	51·4	..	+ 0·7	81	86	5	− 1
,,	G2	..	4	17·65	51·4	52·1	0·7		82	86	4	
May 31	E2	..	4	..	61·3	62·0	0·7	+ 0·9	65	72	7	+ 10
,,	G2	..	4	10·59	61·0	62·6	1·6		60	77	17	
June 10	E2	..	4	..	67·6	68·0	0·4	+ 0·9	66	67	1	+ 3
,,	G2	..	4	12·36	67·6	68·9	1·3		68	72	4	
,, 14	E3	..	7	..	66·6	68·4	1·8	+ 2·9	53	58	5	+ 2
,,	G3	..	7	38·83	66·2	70·9	4·7		57	64	7	
,, 20	E2	..	7	..	68·0	69·1	1·1	+ 1·8	67	68	1	+ 3
,,	G2	..	7	21·18	68·0	70·9	2·9		69	73	4	
,, 21	E2	..	7	..	66·6	67·3	0·7	+ 2·9	67	68	1	+ 4
,,	G2	..	7	17·65	66·2	69·8	3·6		64	69	5	
1913. Jan. 28	E1	5	4	..	63·3	68·7	5·4	+ 0·9	43	50	7	+ 5
,,	G1	5	4	5·72	62·8	69·1	6·3		42	54	12	
Feb. 28	E1	6	6	..	61·9	69·8	7·9	− 0·5	36	57	21	+ 1
,,	G1	6	6	9·04	62·4	69·8	7·4		36	58	22	

(*To be continued.*)

War Service by Technical Men.

The Royal Society are compiling a register of scientific and technical men in Great Britain and Ireland, who are willing to give their services in connection with the war. The register is classified into subjects, and will ultimately constitute a large panel of men of standing whose services will be available whenever any Government Department or similar authority requires specialist assistance. The register is being co-ordinated with those independently compiled by other societies and institutions; but the Royal Society would be glad to have applications for forms from such members of the staffs of colleges and technical institutions as have not yet been registered by any society. The Royal Society are also drawing up, with the co-operation of the principal societies and institutions, a list of scientific and technical men actually on active service in His Majesty's forces. Any names, with rank and unit, for this list will be gratefully received by the Secretaries at Burlington House. The task of forming this register has been much facilitated by the assistance of many universities, university colleges, and scientific societies, whose help the Royal Society gratefully acknowledge.

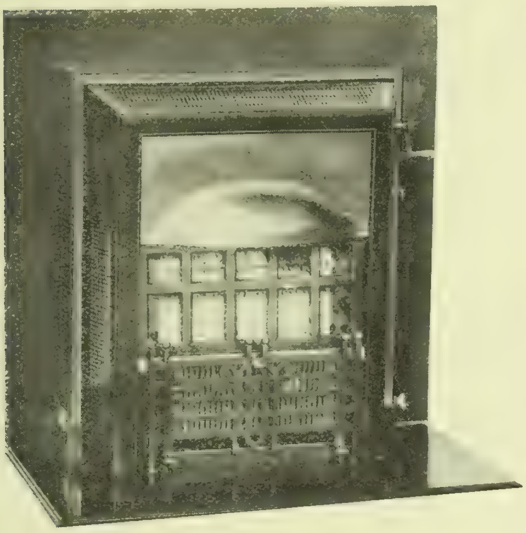
* * *

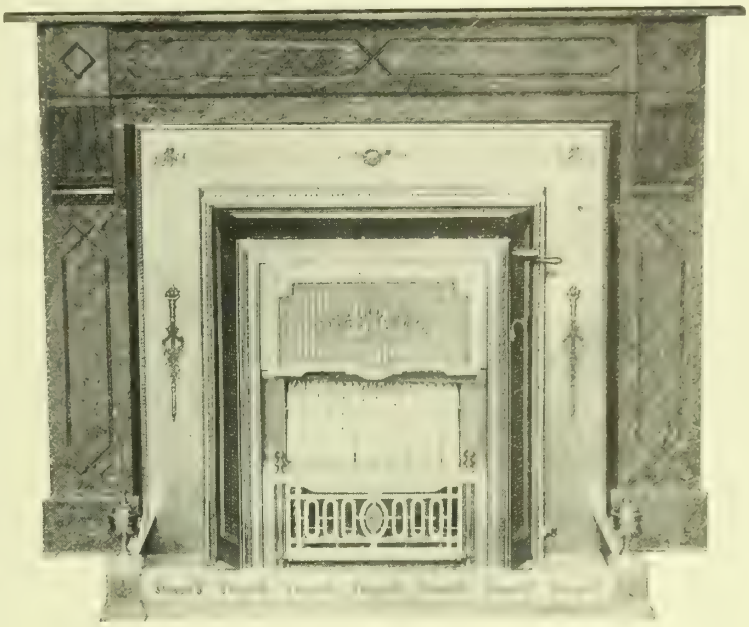
British Association Meeting.—According to "Engineering," the Engineering Section will have presented to them next week reports by two Committees, on Gaseous Explosions and on Complex Stresses. Connected with the former report will be papers on the "Experimental Investigation of the Thermal Efficiency of a Gas-Engine," by Professors G. Asakawa and J. E. Petavel, and on the "Apparent Specific Heats in Gaseous Explosions," by Professor W. M. Thornton. There will also be a paper on a "Unit Gas-Producer for Steam-Boilers," by Mr. E. C. Mills. Of special local interest will be a paper, by Professor A. B. Field, on the "Work of the Mechanical Engineering Department of the Municipal School of Technology at Manchester," and a paper by Mr. de Courcey Meade (City Surveyor of Manchester), the title of which has not yet been announced.

AMERICAN GAS FIRE-PLACE COMPETITION.

The Report of the Jury.

It may be remembered that nearly twelve months ago—see "JOURNAL" for Aug. 25, 1914, p. 476—a Joint Committee was appointed by the American Gas Institute and the National Commercial Gas Association for the purpose of holding a competition for a gas fire-place heater design; and in the "JOURNAL" for the 3rd inst. (p. 236) it was mentioned that the award had been made by the Jury appointed for the purpose—composed of three well-known Philadelphia architects. The winner of the competition is a firm in Rotterdam, known as "R. S. Stokvis and Zonen, Limited," who submitted several designs, two of which are shown in the accompanying illustrations.





There were seventeen competitors, who submitted from one to six designs each; and the decision of the Jury was arrived at only after very careful consideration of all the points. The following extracts are from the letter of the Jury making the award:

> The undersigned, appointed as architects to serve on the Jury for the competition instituted by the American Gas Institute and the National Commercial Gas Association for a fire-place heater burning gas, beg to report that, after a careful examination of all the designs submitted, and a thorough study of the problem, we are prepared to recommend that the award of the prize be made to the design marked "Exhibit B," submitted by R. S. Stokvis and Zonen, Limited, of Rotterdam, Holland.
>
> In arriving at this conclusion, we have taken into consideration the following conditions referred to in the programme.
>
> 1. That the heater should be artistic in appearance both when lighted and unlighted.
> 2. That the heater shall be designed for a fire-place, and shall be a device distinctly for the burning of gas.
> 3. That the heater shall not be an imitation of a wood or coal fire.

Referring to the winning design, the Jury say: "We find that it has artistic merit, and will have a good appearance both when lighted and unlighted. It depends on gas only for its fuel. It is designed to fit in an open fire-place with a flue to carry off the products of combustion; and its designers claim a form of flue construction which allows the greatest efficiency from the combustion of the gas, which nevertheless entirely prevents the escape into the room of the products of combustion. It radiates direct heat from a ceramic material, which is heated to a bright red by bunsen burners; and most of the heat is given off in the form of radiant heat. It is provided with a series of vertical tubes, which, when heated by gas-flames, produce an indirect heat by warming air entering at the bottom of the heater and passing out at the top and sides. The device of a mica screen makes it possible partially to moderate the heat; and when the heater is not lighted, it offers an opportunity for an artistic screening of the front. We consider that the design of this heater offers interesting possibilities in the development of its details."

The Jury also refer to "several of the designs which are worthy of mention, and in a measure they follow the principles of the fire-place to which the award was made, but fall short of it in excellence."

Special mention is made of one design, which was excluded from consideration because it is not really a gas heater. "Nevertheless, on account of its artistic design and its possibilities in connection with heating problems in general, we think it is worthy of separate mention. The principle of this design is that of a grille, which will not only allow the passage of warmed air through it, but also, becoming heated, actually radiates heat. It could be used as well in connection with a steam or hot-air heating plant as with a gas-burner."

Referring to the winning design, which is briefly described in the quotation in the award of the Jury, attention is called particularly to the movable screen, which may be made of mica or other material, of artistic appearance, and which will serve not only as an artistic screen, but as one which will protect the ceramic material from the accumulation of dust at the times when the heater is not lighted. Attention is called by the successful competitor to the fact that this appliance should be connected to a chimney for the purpose of ventilation, but the chimney draught is not essential for proper operation of the gas-fire. While the heater is primarily of the radiant heat type, the circulation of air about the heater gives a good deal of heat of convection—the competitor saying that the temperature of the air issuing from the passages is between 400° and 500° Fahr.

The design referred to by the Jury in their special mention, may be placed in front of a luminous flame heater which does not require a flue connection, and which may, therefore, be available in the rooms where flues are not installed, although, in the opinion of the Joint Committee, this practice is not one to be encouraged.

Some of the other designs are quite similar in principle to that of the winning competitor, and all are interesting.

Further information regarding the designs and the addresses of the various competitors may be obtained by communicating with Mr. W. J. Serrill, the Chairman of the "Joint Committee on Fire-Place Heater Design," to whom we are indebted for the above information, as also for four photographs of the screens on which were exhibited the detail drawings of the various stoves submitted for adjudication. Mr. Serrill is the Engineer of Distribution to the United Gas Improvement Company, Broad and Arch Street Philadelphia.

Employment for Wounded French Gas-Workers.—The Committee of the Société Technique du Gaz en France have appointed a Committee of six to consider the question of finding suitable employment for men connected with the gas industry who have been partially disabled in the service of their country. The Society will be represented by three members (MM. Bigeard, Gautier, and Marquisan), and the other three (MM. Delebecque, Lesage, and Monthiers) will be delegates of the Syndicat Professionnel de l'Industrie du Gaz. Managers of French gas-works are earnestly requested to put themselves in communication with the Committee, at the offices of the Société Technique, No. 94, Rue St. Lazare, Paris, if they have suitable positions to offer.

Metropolitan Munitions Committee.—Excellent work is, it is stated, being done by the Metropolitan Munitions Committee, the organization of which is now practically complete. The jurisdiction of the Committee extends over the whole of the Metropolitan Police area, which has been divided into ten districts, each under a district manager, associated with an assistant and a munitions engineer. It has already been stated in the "JOURNAL" that Mr. G. M. Gill (Assistant-Engineer of the Commercial Gas Company) has been appointed District Manager of the Stepney and Poplar district, and Mr. W. G. Head (Superintendent of Mains of the South Metropolitan Gas Company), of the South-Eastern district. Among the other appointments, Mr. S. H. Wood (of the Beckton Gas-Works) is Manager of the Outer Eastern district, and Mr. A. H. Seabrook (acting) of the Northern district. A central office for the Committee has been established at Alexandra House, Kingsway.

THE MONO-RAIL TELPHER.

ITS INSTALLATION, CARE, AND MAINTENANCE.

By H. C. Widlake, M.J.Inst.E., of the Plymouth and Stonehouse Gaslight and Coke Company.

The mono-rail electric telpher is rapidly becoming a standard plant in modern gas-works; and no greater tribute has ever been paid to its general reliability than the readiness with which gas engineers are both willing and anxious to instal it in positions of vital importance.

No factor contributes more largely to the satisfactory operation of a telpher plant than does the care with which it is, in the first instance, installed and the attention with which it is afterwards handled and maintained. While the breakdown of a telpher may not in normal times lead to a cessation in the manufacture of gas, it is a sure thing that it will lead to the creation of heavy charges for hand labour in connection with the manual handling of hot coke or coal as the case may be. Such charges are of necessity bound to follow upon the breakdown of a single telpher installation in normal times; but in times such as these, when the greatest difficulty is experienced in the proper staffing of works, it is quite possible, and even likely, that such a breakdown would lead to a serious diminution in, if not a total cessation of, the make.

Such possibilities, however, are happily remote in telpher plants where a good machine has been purchased and been installed in an intelligent manner; and it is the author's intention in this article to give a *résumé* of the possibilities of the modern telpher, together with some suggestions which his own experience has shown will result in the satisfactory operation of, and the minimum amount of trouble with, telpher plants.

The engineer who proposes to put down a telpher plant should in the first place look a bit ahead, bearing in mind the capacity of his existing plant, the demands of his district, and the possible extensions which he may have to make during the useful life of the telpher—always having in view the extended use to which in the future he may have to put his telpher and the mono-rail track extensions which the laying down of new gas making plant may render desirable. Alterations and the provision for extensions which can be easily provided for in the original drawings, and at a trifling cost, may often prove to be most costly, if not practically impossible, when once the plant has been put into commission.

He should bear in mind that the machine which he is now putting in for the handling of coal will do equally well for the conveying of coke from the discharge side of his retorts to an outside storage, provided he designs his track and machine with this possibility in view. If in the future he decides to put down a telpher coke-handling plant, it would be a great advantage if his general arrangements permitted of his linking-up the two tracks in such a manner as to enable him to use either telpher for either purpose. It is necessary, of course, to make special arrangements to enable the machine to handle either a coke skip or coal grab.

The mono-rail telpher has now been established in such a large number of works that it is possible to give a reliable account of the results which may be expected, the cost of maintenance, and to show clearly what advantages telpherage possesses over other methods of conveying. It is important to distinguish between telpherage which is a mono-rail system and the earlier—and in the writer's opinion less efficient—form of "transporter" which runs on the inside of the bottom flange of a beam or girder of H section; and in a later portion of this article it is proposed to deal more fully with this point.

Among other matters that have to be considered when it has been decided to supersede hand labour or out-of-date machinery by new plant the most important factors are working efficiency, maintenance, convenience, and first cost.

Working Efficiency.

The question of working efficiency is inseparable from that of convenience; and both these factors give rise to the question, What is the right kind of plant to instal having regard to the facilities required? It is then that the following points crop up: Load, maximum lift required, length of travel, whether the route is curved or straight (this is a point of vital importance), variation of delivery height, whether the load has to be picked up again by the same plant for further conveyance, and speed of working.

If the run is short and straight, at an unvarying height, and the load does not have to be picked up again after discharge, then it may be said that the telpher does not, under ordinary conditions, show to any advantage over the ordinary type of tipping conveyor. On the other hand, where these simple conditions are reversed, and material has to be transmitted at either a considerable or a varying height over a long curved route, or where, in addition to these circumstances, perhaps, the load has to be handled again, then there are emphatically conditions which can be best met by the installation of a telpherage system.

For quayside work the telpher can be run out on a hinged cantilever beam over the hold of the vessel to be loaded or unloaded; while when not in use, or to permit of shifting the boat or berthing her, this cantilever beam may be raised to a vertical position. In deciding the type of conveyor plant to be put down, the following facts regarding telpherage are worth noting.

Points Regarding Telpherage.

(1) The high speed at which material can be transmitted by an overhead telpher—500 to 700 feet per minute is quite ordinary practice—gives this machine a very decided advantage over all other types of conveyor.

(2) The working efficiency is very high, as the provision of a single rail for travelling the load upon, and with the provision of the direct lifting arrangement employed, the frictional losses can be cut down to a minimum.

(3) Comparing this system with, for example, any tray or bucket conveyor, especially where the material has to be first lifted to the conveying level, it is obvious that telpherage means a considerable saving in the power bill.

(4) As to the actual power required, it may be safely accepted that the cost of power to work a telpher is not more than half that required to work a bucket or tray conveyor. This has been proved by records taken over long periods and by individual tests. It has, for instance, been found that for a retort-house telpher handling hot coke in 35 cwt. gross loads, at a 30-feet height, and a 600-feet travel, the current consumption per working cycle was about 0·2 B.T.U., or under 0·12 B.T.U. per ton.

At a recent test made by the author on the plant under his charge 531 tons of coal were shifted over an average run of 300 feet, at a 20-feet lift, at the expenditure of 105 B.T.U., or under 0·2 unit per ton of material handled. At the first glance this may appear rather at variance with the figure previously given in connection with the coke-handling plant; but in the latter connection the ratio of dead weight of grab to net weight of coal was approximately 1·25 to 1, while in the case of the coke-handling plant the ratio existing between the weight of the skips and the coke was 2 to 3 (approximately). Hence the higher consumption per ton of material handled.

Maintenance.

It is intended at a later portion of this article to deal closely with the maintenance question; but it may be mentioned at this stage that much naturally depends upon the facility of access to the machine and the promptitude with which renewals can be carried out—as much indeed as upon the cost of the new parts required. The length of time which a plant is out of action for repair is an important item, apart from the actual wages charges. The interest on capital and depreciation charges goes on whether the plant is working or not, and should be booked against it at all times. Hence the cost of replacements, accessibility, and speed with which necessary repairs can be effected must all be taken into account when considering the total cost of maintenance.

Under average conditions the cost of renewal parts for a 35 cwt. machine may be taken at a maximum of £20 per annum; but records from many plants show a renewal cost far below this figure, which it may be suggested should be compared by interested readers with the cost of a new chain for a conveyor having the same capacity. These figures seem very low for a plant in heavy use; but it must not be forgotten that in a telpher plant all the wearing parts are visible and easily accessible, and consequently most of the wear that takes place can be seen and remedied by the application of the "stitch in time." The electric equipment of the mono-rail telpher is of the most robust character, and can be insured against breakdown at a nominal annual premium.

Capital Cost.

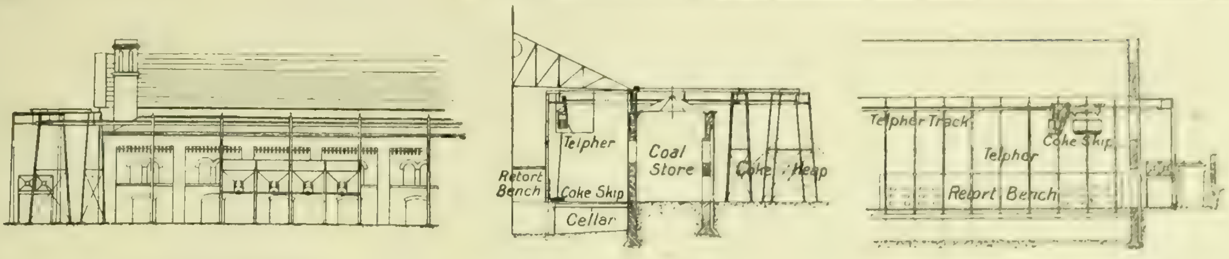
It is somewhat difficult to obtain a true comparison of the first cost of different installations, for the simple reason that it is practically impossible to find two different kinds of plant operating under exactly the same conditions. So far, however, as can be ascertained, after considerable deductions, allowances, and averaging, it may be said that there is not really much difference in the cost where the actual conditions are approximately equal.

To make a true comparison, it is necessary to take into account all the factors of which mention has already been made, and in many cases where a comparison has been made, and made in favour of the ordinary type of conveying plant, it may be found on closer investigation that some of the factors have been omitted, and that, for instance, the route over which the telpher is taking a load could not possibly be served economically by any other class of plant.

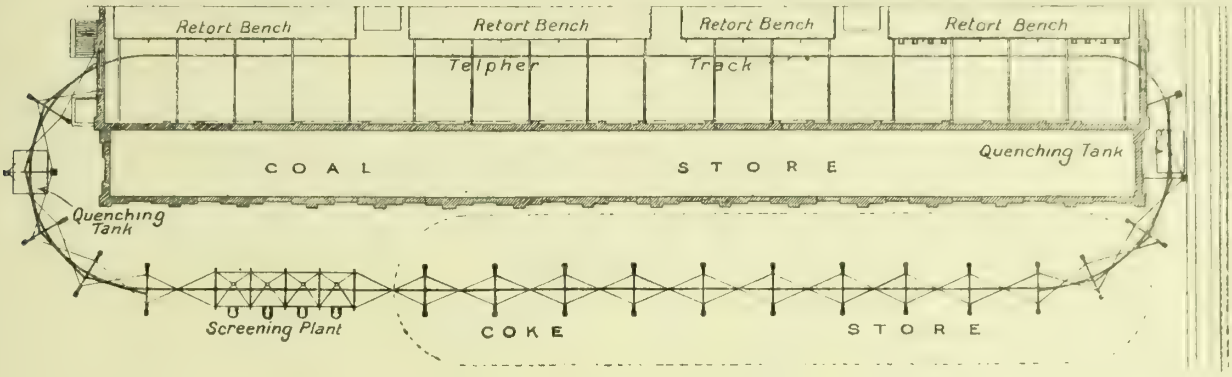
Coke Handling.

It is proposed later to deal with the possibilities of the telpher for handling hot coke from the retort mouth to the quenching tank, and thence to the storage accommodation. Many of the reasons which give the telpher an advantage for this class of duty are common to any duty for which it may be employed—namely: (1) Low capital cost, (2) low maintenance, (3) small power required for driving, (4) all parts easily accessible, (5) simple construction, (6) capable of easy extension. In addition to these, the following are the peculiar advantages which make this machine particularly suitable for this class of work: (7) All working parts are removed from the action of heat and from the coke, (8) no interference with the drawing stage, which may be kept perfectly clean and dry, (9) no breakage of coke, (10) better working conditions in the retort-house.

Fig. 1 shows in plan a particularly complete arrangement in use at a large English gas-works. The telpher track forms a continuous loop, passing over the discharge side of the retorts, over a quenching tank outside each end of the retort-house, and over



Part Front Elevation. Cross Section. Part Sectional Elevation.



Plan of Ground.

FIG. 1.—ELECTRIC TELPHERAGE CONVEYING PLANT FOR HOT COKE.

a screening plant. The track is supported by hangers at intervals of 15 feet; the supports being close, to give ample support. The hangers are suspended from the underside of substantial box-girders, which are arranged in long spans for the purpose of limiting the number of necessary stanchions and keeping the coke yard as clear as possible.

POINTS OF DIFFERENCE BETWEEN THE MONO-RAIL AND THE BOTTOM-FLANGE SYSTEMS.

Speeds.—The standard speeds for mono-rails vary from 500 to 700 feet per minute; while the speeds attained with the bottom-flange system rarely exceed 400 feet per minute—the usual run being 250 to 300 feet per minute. In this connection, it may be said that, where the conditions permit, speeds of from 800 to 1000 feet per minute can be attained with the mono-rail system. For the same load and speed the power required to propel a transporter working on the bottom-flange system will be found to be nearly three times as much as that required in the case of the mono-rail telpher.

Wheel Mounting.—In the design of the top-rail machine, each wheel axle is provided with a roller bearing on each side of the wheel; the bearings in the case of machines up to the 3-ton size being 2 inches in diameter and 5 inches long. With the bottom flange system the wheel bearings can only be of a very limited area—usually about 1½ inches diameter by 2 inches long—on account of the forced use of short overhung axles; while these axles are very badly placed for strength. With the mono-rail system, it will be seen that the axles are mounted as beams and are in double shear—there being a bearing at each end; while in the bottom-flange system the axles may be likened to cantilevers, and are mounted in single shear.

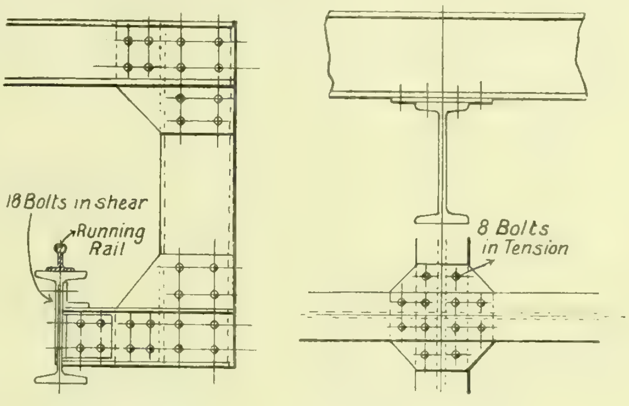
Curves.—In the case of the mono-rail telpher system, very small curves can easily be negotiated; the combination of the single rail and the free swivelling bogie ensuring perfect freedom and steady travelling, even on curves of small radius and with heavy loads. With bottom-flange working, sharp curves have necessarily to be avoided, as it will be seen that when taking a curve the inside wheels are bound to slip, on account of the linear speed of the machine on the outer path of its travel being greater than it is on the inner path. In this respect, it may be pointed out that a differential gear, such as is used on motor-cars, would seem to be necessary. There is naturally a great deal of grinding in the bottom-flange curved track even with moderate loads; but when the general working conditions are severe, as they almost always are in gas-works, the curves are likely to cause considerable trouble on this system. Sometimes running rails are applied to the inside of the flanges on this system; but these are difficult to renew, while the flange is always considerably weakened by the necessary bolt holes.

Method of Supporting the Tracks.—In the case of the top-rail system, the top of the track has to be used for the running rail. It is consequently necessary to use an entirely different method of supporting the track from that generally used for the bottom-flange track; the latter being simply bolted up to its supporting girders through the top flange. The top-rail track is supported by the web, leaving the top flange clear for the rail, and the bottom flange clear of all obstruction in order to give the necessary running clearance. Distinct structural advantages accrue from the practice of supporting the track from its web and not from its flanges, among which may be mentioned—

(1) A liberal support may be given without appreciably weakening the track—conditions which cannot be avoided if the track is supported by the flange.

(2) In the case of the mono-rail track, the bolts or rivets are in shear instead of in tension as they are in the bottom-flange track.

Fig. 2 shows the two distinct methods of supporting the mono-rail track and the bottom-flange track; and it will be seen that the conditions of loading the two tracks vary greatly. In the case of the bottom-flange track, the load is applied on the inside of the two flanges; and when the machine is travelling on a curve, unequal loading is bound to occur on the two flanges, owing to the tendency of the outer wheels to lift, due to centrifugal force, which puts a twisting strain on the track. Like conditions also arise when the machine is exposed to windage.



Mono-Rail System. Bottom-Flange System.

Fig. 2.

In the mono-rail system, on the other hand, the load is applied centrally at the top of the track rail—thus avoiding local flange stress and wear and tear on the track flange. When taking a curve, the action due to centrifugal force is just as apparent as with a bottom-flange machine; but in this case the load is not thrown on one flange. The point of application of the load is not appreciably altered from static conditions, and the line of "hang" of the machine is only diverted slightly from the centre line of the track, and there is practically no twisting strain set up on the track due to centrifugal force or windage.

Wear and Tear.—As regards comparative wear and tear, the main difference occurs on the travelling wheels and track; and from the description given above, and by comparing the driving powers necessary in the respective cases, it will be evident that there should be a considerable saving in the cost of renewals on the mono-rail system. On the mono-rail system the wear and tear on the track rail is very easily made good; the single bulb rail used being simply clipped to the top flange in convenient lengths of about 20 feet. In the bottom-flange system, it is either a case of renewing the running girder bodily, or where inside running strips are used two special strips to suit the taper of the flange have to be drilled, countersunk, and fitted to the bottom flange of the running girder. Apart from the question of the curves, the wear and tear on all parts of the track is much greater than with the mono-rail system.

With regard to the wear and tear on the hoisting gear, this is approximately the same where similar arrangements of gear are used. It should be noted, however, that with the direct-lift system there are no intermediate rope wheels between the lifting barrels and the load; and this, combined with the absence of reverse turn in the rope, conduces to a much higher efficiency than the older arrangements.

Cost.—Both the mono-rail machine as well as the track on which it runs are more costly than the machine and track on the bottom-flange system, chiefly by reason of the special arrangement of hangers which are necessary to the proper suspension of the running track. It must not be forgotten that every change in the load requires special designing in order that the balance may be kept. Any material change in the electrical equipment necessitates special consideration for the same reason.

It will, of course, be seen, from the nature of the mono-rail system, that the whole weight of the machine and its load must be absolutely balanced about the centre line of the track; otherwise the machine will hang out of plumb. This necessity for accurate balance is the chief contributor to steadiness and safety of running at high speeds and under heavy loads.

Summing up, it may be said that the mono-rail system is one which must naturally appeal to an engineer. By its means he can practically encircle any portion of his works in a truly mechanical manner and carry out his conveying at a minimum cost; while the mono-rail telpher readily lends itself to extension and to the keeping pace with those changes which are inseperable from any works in a growing district.

(*To be continued.*)

COKE-OVEN PRODUCTION IN AMERICA.

[From the "Iron and Coal Trades Review."]

According to the advance statement issued by the United States Geological Survey, the production of coke in the United States in 1914 was 34,555,914 net tons (2000 lbs.), valued at $88,334,217. Of this, 23,335,971 tons were made in beehive ovens with an almost total loss of the bye-products, and 11,219,943 tons, or 32·5 per cent., were produced in bye-product ovens, with a recovery of more than $17,500,000 worth of bye-products, or approximately $1·55 for each ton of coke. At the end of 1914 there were 99,755 ovens in the States, of which 5809 were bye-product ovens and 93,946 were beehive. Of the bye-product ovens, 667, or 11·5 per cent., were idle throughout the year, and 44,450, or 47·3 per cent., of the beehive ovens were idle. At the end of 1914 there were under construction 644 new bye-product ovens and 605 new beehive ovens. During the year 71 bye-product ovens were abandoned, all of which it is expected will be replaced by others of the retort or distillation type, and 3603 beehive ovens were also abandoned.

The following table shows the development of production during the period 1880 to 1914:—

Year.	Ovens.		Coke Produced (Net Tons).
	Built.	Building.	
1880	12,372	1159	3,338,300
1890	37,158	1547	11,508,021
1900	58,484	5804	20,533,348
1910	104,440	2567	41,708,810
1911	103,879	2254	35,551,489
1912	102,230	2783	43,983,599
1913	102,650	1321	46,299,530
1914	99,755	1209	34,555,914

The following table shows separately the production of beehive and bye-product coke in the States over a series of years:—

—	Bye-Product Coke.		Beehive Coke.		Total.
	Net Tons (2000 Lbs.).	Per Cent. of Total.	Net Tons (2000 Lbs.).	Per Cent. of Total.	Net Tons (2000 Lb .).
1893	12,850	0·01	9,464,730	99·99	9,477,580
1901	1,179,900	5·41	20,615,983	94·59	21,795,883
1907	5,607,899	13·75	35,171,665	86·25	40,779,564
1908	4,201,226	16·14	21,832,292	83·86	26,033,518
1909	6,254,644	15·91	33,060,421	84·09	39,315,065
1910	7,138,734	17 12	34,570,076	82·88	41,708,810
1911	7,847,845	22·07	27,703,644	77·93	35,551,489
1912	11,115,164	25·27	32,868,435	74·73	43,983,599
1913	12,714,700	27·46	33,584,830	72·54	46,299,530
1914	11,219,943	32·50	23,335,971	67·50	33,555,914

In some factories in the United States, the practice is being adopted, says "Popular Mechanics," of painting all machinery with a white oil-proof enamel. The ceilings are painted with the same material whenever possible, so as to facilitate the use of indirect lighting. It is stated that the light reflected from the machinery is most valuable in eliminating inconvenient shadows and diffusing the illumination. In one case, it was found possible to take a photograph in a workshop of this kind in one-seventh of the exposure that would have been required had ordinary unpainted machinery been used.

METHODS OF UTILIZING LIGNITE.

Gas Making and Bye-Products.

With a view to the adoption of better methods of utilizing the vast quantities of lignite, or brown coal, which exist in Southern Saskatchewan, the Government of the Province some time ago set on foot investigations; and a report has been submitted to the Highway Commissioners of Regina by Mr. S. M. Darling on the work carried out by him in connection with the matter during last year. The methods dealt with in the report are the utilization of the lignite by way of drying, carbonizing, and briquetting it; and experiments have been made to determine its value as a source of power, domestic and furnace fuel, and hydrocarbon and ammonia bye-products.

It appears from the report that the quantity mined annually in Saskatchewan has aggregated about 200,000 tons for several years. Despite the large increase in population, the output does not increase. Indeed, of late, there has been a slight decrease. This falling off in tonnage is due entirely to the encroachment upon the lignite territory of eastern and western coals. The reason the lignite is not able to hold its own is found in some of its physical characteristics. A large number of samples tested averaged:

	Per Cent.
Moisture	26·13
Volatile hydrocarbons	28·11
Fixed carbon	38·16
Ash	6·86
Sulphur	0 74

The large percentage of moisture has not been absorbed from extraneous sources, but is the portion remaining from the great amount of water present in the peat from which the lignite was formed. The necessity for the evaporation of this water in the furnace is, of course, an enormous handicap on the fuel. When lignite is mined and exposed to warm air and sunlight, the evaporation of the water causes the coal to disintegrate or slake very rapidly. It also fires very quickly from spontaneous combustion; hence it is not practicable to ship it long distances or to store it; Its light gases distil before the fixed carbon reaches the temperature of ignition, and, in the ordinary furnaces, escape unconsumed. The lignite has no "coking" quality whatever, and when thrown on to the fire crumbles very quickly, giving rise to difficulties in firing and substantial loss through the grate-bars. The fact that the percentage of sulphur is small is a good feature. There is an almost entire absence of the corrosive acid resulting from the combination of sulphur with water when lignite is burned. Further, should lignite gas ever be used as a town gas for heating, cooking, and illuminating purposes, there will be almost no sulphuretted hydrogen to be removed by means of hydrated oxide of iron purifiers.

CARBONIZED LIGNITE.

After dealing with the burning, drying, and briquetting of lignite, Mr. Darling devotes attention to its destructive distillation, so as to extract all the volatile matter naturally contained in it, and utilize the resulting gas, ammonia compounds, liquid hydrocarbons, and residual carbon or coke in the various ways for which they are best adapted. Here it is remarked that the problem of an efficient lignite carbonizing oven has not been an easy one to solve. Elaborate and very efficient devices have been evolved to carbonize or coke bituminous coal. In all of these, however, the work is done at high temperatures, to get a large yield of gas, rather than at low temperatures, with a view to an increased amount of hydrocarbon bye-products. Then, too, because of the fact that bituminous coal cokes, very different apparatus is necessarily needed to handle it from that required for lignite, which has no coking or intumescing quality whatever; but, instead, it crumbles during carbonization.

Brief reference is made to early efforts to carbonize lignite, beginning about thirty years ago, and continuing to 1907, when the Laclede Gas Company, of St. Louis, equipped an experimental bench of four retorts, in which some Arkansas lignite was carbonized under Mr. Darling's direction. The object of this test was to determine whether or not the gas was of sufficiently good quality to be used as illuminating gas in the city. It was found, however, the report continues, that the gas contained a very large percentage of carbon dioxide—about 16 per cent. by volume. This almost entirely destroyed the value of the fair percentage of illuminants present. The following is a comparative analysis:—

	Lignite Gas. Per Cent.	Coal Gas. Per Cent.
Carbon dioxide	15·9	1·34
Illuminants	3·5	4·42
Oxygen	0·2	0·03
Carbon monoxide	19·5	6·75
Methane	16·1	34·60
Hydrogen	43·9	50·19
Nitrogen	0·9	2·67
—	—	—
Candle power	3·2	16·00
B.Th.U. per cubic foot	440·0	630·00

While the lignite gas, therefore, has little illuminating value when burned as an open flame, it gives good results when burned in a mantle, and is very serviceable for fuel and power in furnaces and gas-engines.

The work with these two benches of horizontal retorts showed conclusively that if lignite is to be carbonized on a large scale, some different type of apparatus must be used. These retorts were, of course, always kept at a high temperature; but even then the process was too slow. When one charge was carbonized, the end door was opened, and the residual carbon raked out. This was red hot, and in a more or less fine state of division. It burned immediately upon contact with the air; and water thrown on to the hot pile would not penetrate the mass as in the case of bituminous coke. It was necessary to almost saturate the material before it could be handled. It was plain that this carbon must be discharged from the retorts mechanically, and kept out of the air until cooled to the point at which it would not burn.

Again, in carbonizing the lignite, it is desirable that as large a yield as is possible of the hydrocarbon bye-products be obtained. This necessitates that the lignite must not be subjected to a high temperature till most of the volatile matter has been distilled. Of course, throwing the lignite directly into a red-hot retort, as is done in coal-gas practice, produces a larger volume of gas and a smaller yield of oil or tar. If the retorts were kept at a much lower temperature, there would be a larger yield of oil and a smaller volume of gas. But this would make the process so slow as to be unprofitable. The fact that the lignite crumbles on being carbonized makes possible a continuous carbonizing process—thus obviating the laborious and expensive charging and drawing of retorts, as practised in coal-gas plants.

Following the work in St. Louis, therefore, Mr. Darling built a carbonizer in Chicago, the essential feature of which was an inclined, slowly rotating, cylindrical iron retort, 14 inches diameter and 15 feet long. This cylinder passed through a stationary combustion chamber; the highest temperature being maintained at the lower, or discharge, end of the retort, and the flue gases escaping at the upper, or feed, end. The motion of the retort drew the lignite continuously out of a hopper at the upper end, and discharged the carbonized material into a cooling device at the lower end. As the lignite passed through this rotating retort, it encountered a gradually increasing temperature, until it was finally discharged red hot into the cooler. This resulted in a large yield of oil or tar, averaging upwards of 20 gallons per ton of Arkansas lignite. While this was an efficient type of carbonizing device, the iron retort deteriorated very rapidly under the high temperature. There are also many mechanical obstacles in the way of constructing and operating a large installation on this plan.

There was then built a third carbonizing oven, using as retorts vertical cast-iron tubes, the lower portions of which were protected with fire-clay tile. Here, too, the maximum temperature was at the bottom—the flue gases escaping at the top. Continuously fed and discharged, this also gave the essential progressive carbonization, and did the work satisfactorily in every respect. In operating this oven, lignite from Williston (North Dakota), was used, which is in all respects like the Saskatchewan product.

THE SASKATCHEWAN EXPERIMENTAL OVEN.

Ultimately, the Saskatchewan Government commissioned Mr. Darling to erect and operate at Estevan a small lignite carbonizing and briquetting plant. The idea was not so much to do fine-drawn laboratory work, as to actually treat the lignite on a sufficiently large scale to be able to use the products in every-day commercial work.

The carbonizing bench erected may be described as a vertical chamber oven. In principle, it is the same as the large horizontal bye-product chamber ovens, which are the most efficient devices for the coking of bituminous coal, except that it is vertical instead of horizontal, and is charged and discharged continuously instead of intermittently.

The lignite is unloaded from the cars into a bin in the bottom, and extending the whole length of the building, passed as required through the crusher, elevated to the top of the oven, and distributed to the several retort sections. It passes down through, and is discharged red hot from, the bottoms of the retort sections into a hopper, from which it is conveyed and elevated to the screen, which separates it into three sizes and deposits them into their respective bins above the raw lignite bin. The discharge hopper, conveyor trough, elevator leg, and the bins are kept charged constantly with exhaust steam from the gas-exhauster engine. The lignite carbon or coke is therefore kept in an atmosphere of steam until it will not burn on exposure to the air. The portion that is briquetted need never get cold.

The inside dimensions of the oven are 8 feet by 9 ft. 7 in. by 12 feet high. The rectangular retort sections are 12 feet high, 6 inches wide, and 8 feet horizontally, and alternate with series of combustion flues. Each layer or column of lignite is 6 inches thick, and has a heating flue on either side of it. Thus the heat is driven into the midst of the slowly descending body of lignite. The retort sections hold in the aggregate 4 tons of lignite; and the oven carbonizes 24 to 36 tons of raw lignite per 24 hours.

The gas generated in the retorts is withdrawn by an exhauster, and passed through cooling and washing apparatus, where the hydrocarbon and ammonia compounds are precipitated, and then on to the gas-burners located at the bottoms of the retorts. The flue gases are discharged at the top of the bench.

It will be noted that the lignite starts at the top of the retorts under a low temperature. As it descends slowly, it encounters a gradually increasing degree of heat, until it is discharged from the bottom of the oven red hot. The essential feature of this type of oven is that of progressive distillation—passing the lignite gradually from an atmospheric temperature to a zone of red heat. This results in the same substantial increase in the yield of hydrocarbon bye-products obtained when carbonizing at low temperatures, and yet the work can be carried on with the same speed as is possible with a high degree of heat. The entire process is mechanical.

The lignite carbonizes much more readily than bituminous coal. The most rapid evolution of lignite gas is given off between 700 and 900° Fahr. The gas is practically all off at 1000° Fahr. On carbonization, the products, in round figures, are:

Gas per ton of lignite	10,000 cubic feet
Oil or tar (water free)	15 gallons
Ammoniacal liquor	65 gallons
Carbon residue	955 lbs.

These are the proportions obtainable in good commercial practice. In the laboratory tests, the yields of gas exceeded 11,000 cubic feet per ton, with practically no increase in the amount of tar, as the last 1000 cubic feet of gas contains very little condensible hydrocarbon.

THE GAS.

The heating value of the gas averages above 400 B.Th.U. per cubic foot. As remarked earlier in the report, it is not good illuminating gas, unless burned in a mantle, but makes a good town gas for heating and cooking, and is very serviceable for industrial fuel and power in furnaces and gas-engines.

There is more gas in a ton of lignite than is required to carbonize the next ton. In practice, only sufficient gas would be removed to supply the requisite fuel to carry on the carbonizing process, the remaining portion being left to add heating value to the carbon residue; or all may be extracted, and the surplus used in a gas-engine to generate power, or for burning tile, pottery, brick, &c. Or the entire yield may be so used, or sold as town gas, and the carbonizing carried on by means of lignite producer gas. About 6000 cubic feet of the gas yield per ton is required to carry on the carbonizing—leaving a surplus, costing nothing, of 4000 cubic feet per ton to be used for power. This 4000 cubic feet of gas, of 400 B.Th.U. per cubic foot, yields 1,600,000 B.Th.U. The average gas-engine uses 10,000 B.Th.U. per horse-power-hour, which gives 160 horse-power-hours from the surplus gas per ton of lignite carbonized.

THE OIL OR TAR.

There is not the large yield of oil or tar from the Saskatchewan lignite that there is from the lignite mined near Lester, Arkansas. On distillation, the fractions are:

	Per Cent.
Light oils, benzene, &c.	11·5
Carbolic oils, some naphthalene	13·5
Creosote oils.	34·1
Anthracene oils, some paraffin	16·4
Pitch, hard	24·5

THE AMMONIACAL LIQUOR.

There are about 15 lbs. of sulphate of ammonia per ton of lignite. It is easy of recovery, by passing the gas, after the tar has been extracted, through a sulphuric acid solution. Ammonium sulphate crystallizes out, and is raked-out and dried, when it is ready for the market.

THE CARBON OR COKE.

When carbonized, the lignite is practically charcoal. It has about the same analysis as anthracite, and has about the same heating value; but it is not so dense in structure, and therefore has more bulk per ton than anthracite. After passing through the carbonizing bench, the lignite is screened into several sizes. The dust and smaller sizes must be briquetted; the larger lumps, somewhat above the size of "pea" anthracite, are available for use in gas-producers for the production of power.

The use of carbonized lignite in gas-producers, for generating gas for fuel purposes, is then considered; the remark being made that it constitutes an ideal gas-producer fuel. The amount of gas is equal to that from anthracite, pound for pound; but the gas is richer, it has less tar and clinker, and burns more freely.

Entertainments at the American Gas Institute Meeting.—Mr. George G. Ramsdell, the Secretary of the American Gas Institute, writes in regard to the meeting at San Francisco next month: The entertainment provided will be ample and thoroughly Californian. Among the things tentatively arranged will be a President's reception and ball on Monday evening, Sept. 27; and this will be followed throughout the week by a round of pleasures—including an automobile trip for the ladies through Golden Gate Park, with a luncheon at the Cliff House, returning through the Presidio to the exposition grounds. An afternoon will be devoted to "Gas Congress" day, with exercises at Festival Hall. There will be a presentation of a bronze medal to the President of the International Gas Congress by the President of the Panama-Pacific Exposition, and probably the paper on the "Illumination of the Exposition" by Mr. W. D'A. Ryan, who is the wizard who conceived the magnificent lighting effects of the exposition. A dinner and dance in the exposition grounds is contemplated, as well as a night on the Zone, and an evening devoted to special illumination of the exposition with fireworks in honour of the International Gas Congress. Special efforts will be made to entertain the ladies of the party—such as the inspection of some of the celebrated stores and trips to Chinatown.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Coke-Oven Plants and Toluol Recovery.

Sir,—In your editorial reference of Aug. 17, after a highly appreciative reference to the endeavour of the "Yorkshire Post" to draw the attention of the Parliamentary War Savings Committee and of the public to the fact that our supplies of toluol, and therefore of the high explosive trinitrotoluene, depend largely on the consumption of gas, you say:

> The "Yorkshire Post" had a little fall in supposing that the coke-oven plant owners were not doing a good part in connection with the recovery of toluol; and there were protests from that quarter.

These protests, however, have elicited a valuable correspondence in the "Yorkshire Post," from which it appears that the coke-ovens are doing far less than they might, and should.

I may be permitted to quote a letter of which the expert authorship is not hidden by the fact that it appears merely over the initials "H. J. H." "H. J. H." points out that while, of 8348 bye-product coke-ovens tabulated in 1914, 6373 were fitted with plant to recover benzol and toluol, the great majority of coke-ovens in this country are beehive ovens, in which no bye-products are recovered. At the end of 1913, there were still in this country 13,167 beehive ovens, as against 7839 bye-product ovens.

It was only, as you said, "a little fall" which the "Yorkshire Post" suffered; and it is much softened by such testimony as that of "H. J. H." The inference, therefore, remains, that the existing state of things needs to be remedied, and that if the gas-works are not yet doing all they might in regard to the production of toluol, the coke-ovens, as a whole, are doing much less. The important thing, however, is not that the "Yorkshire Post" is shown to have been in the main correct, but that the conditions noted should be improved, and that the recommendations of the Parliamentary War Savings Committee, with a view to the highly needful inculcation of thrift, should be made with full knowledge of the consequences.

Writer of the Leading Article in the "Yorkshire Post."

Leeds, Aug. 20, 1915.

REGISTER OF PATENTS.

Production of a Liquid Fuel and Illuminant from Tar.

Markl, A., of Prag-Zizkov, Bohemia.

No. 10,383; April 27, 1914. Convention date, May 2, 1913.

This invention aims at obtaining from tar itself, or from the fluid residue which remains after distilling off the benzene, toluene, and other light constituents, a product which, by reason of its properties, can serve as a substitute for mineral oil, both in heating and illuminating, and also for driving engines.

According to the process suggested, tar from any source—either as it is or after its light constituents have been distilled off—is allowed to stand at ordinary temperature mixed with a very weak aqueous solution of alkali—*e.g.*, containing from ½ to 1 per cent. of KOH—preferably warm and preferably with temporary mixing or agitation. Having regard to the fact that the substance treated contains at least 5 to 7 per cent. of phenols, the amount of alkali employed is insufficient to bring about their solution. In the process now patented, the mass separates into two layers—an upper aqueous layer and a lower tar layer. After the aqueous layer has assumed a light garnet red colour—which will be the case after a longer or shorter time, according to the concentration of the alkali solution—the tar is drawn off and subjected to distillation; and the light coloured oily fraction which distils over after the water and ammoniacal liquor at a temperature not below about 200° C., represents the new product.

The following is given as an example of the manner in which the process may be carried out. Into the vessel containing 100 parts by weight of crude tar—freed or not from the benzene, toluene, and other light constituents—is poured 100 parts by weight of a warm 1 per cent. solution of caustic potash. The tar is then mixed with the caustic lye, and the mixture is allowed to stand for six hours with temporary stirring or agitation. Immediately after the agitation, the aqueous layer on top shows a light red colouration, which deepens in tone in the further progress of the process. After cooling the tar layer, this is transferred into a distilling apparatus (of any known kind) of such a size that the contents do not rise into the receiver in consequence of the foaming which at first occurs by reason of the water contained in the distillation mass. After water has passed over at 100°, ammoniacal liquor distils over at 100° to 110°. If the temperature is then raised to 130° to 150°, the mass boils quietly; and at about 200° to 280°, after a little cloudy oil has first distilled off, the light coloured transparent oil distils over. This is suitable as a heating and illuminating oil.

In further characterization of the new product, the following particulars may be given. It shows a green fluorescence; is thinly fluid; smells little of tar; has a specific gravity of ·9997 at 15° C.; and 100 parts by weight of the oil contain 80·39 per cent. of carbon, 7·74 per cent. of hydrogen, and 11·87 per cent. of oxygen, nitrogen, and other substances. Owing to the fact that the oil contains together 88·13 per cent. of carbon and hydrogen, its heating value is extremely high—namely, 8313 calories. A further advantage of the oil is said to consist in the fact that, owing to its extremely small content of ash (0·005 per cent.), it burns almost without any residue in spray burners. It flashes at about 70° to 75° C.; and its fire test is about 110° to 115° C. It solidifies at about − 30° C.

Obtaining Low-Boiling Hydrocarbons (Benzene Substitutes) from Bituminous Coal.

Plauson, H., and Schroder, P., of Hamburg.

No. 4340; Feb. 19, 1914.

This invention relates to the distillation of brown coal or lignite in the presence of liquid hydrocarbons for the purpose of obtaining benzene substitutes of low boiling point in a considerably larger proportion than hitherto.

In the dry distillation of brown coal or lignite, the patentees remark, it is known that approximately from 4 to 5 per cent. of liquid hydrocarbon are obtained, of which only a small fraction—approximately 2 to 3 per cent.—has as low a boiling point as 100° to 150° C. To obtain smokeless fuel in the form of coke or briquettes, slack coal has been mixed with (say) 10 per cent. of liquid hydrocarbons—such as gas tar—and heated in a coking chamber in the presence of air and steam, in order to remove its volatile contents, and to produce a dense, hard coal; or for the same purpose coal has been heated in a closed chamber in the presence of steam and alkaline salts; or briquettes have been made from coke dust mixed with a trace of a combustible (such as nitrate of potash) or with carbonate of potash and a small percentage of resin, coal tar, or other binding agent. The product in these cases is mainly gas suitable for heating or lighting purposes, whereas according to the present invention approximately 4 per cent. of the coal is converted into liquid hydrocarbons of low boiling point adapted for use as benzene substitutes—in other words, 100 parts of coal produce 4 parts of liquid hydrocarbons.

The process is as follows: 100 parts by weight of lignite are ground to powder (the fineness of cement) with 100 parts of hydrocarbons—such as crude naphtha, for example—in a drum mortar mill or similar apparatus. Approximately 3 to 5 per cent. of nitrate salts (alkaline earth or alkali salts) are then added to this mixture. The distillation that follows is effected by conducting air, heated to 1000° C., to a distillation chamber; the air being previously mixed with steam, so that the temperature is reduced to about 700° to 600° C. by the time the air-steam mixture reaches the distillation chamber. Simultaneously with this air-steam mixture, the coal treated with naphtha and nitrates is sprayed into the distillation pipe as in coal-dust firing, "whereby an instantaneous decomposition of the coal-naphtha mixture into hydrocarbon and simultaneous setting free of hydrogen take place." The vapours are condensed in some suitable cooling apparatus and fractionated in any known manner.

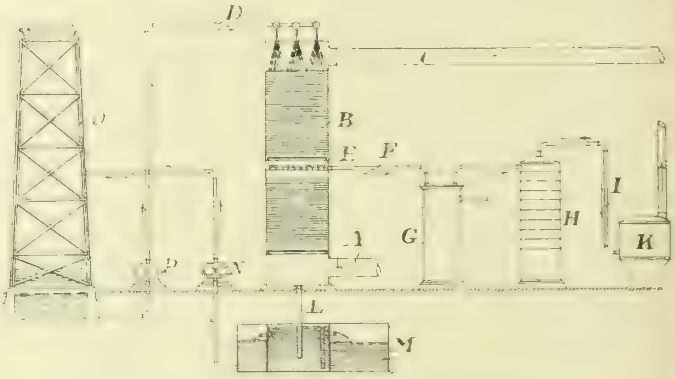
By the process described, approximately 4 per cent. of the coal and 18 per cent. of the crude naphtha employed are said to be converted into low-boiling (80° to 150° C.) constituents utilizable as benzene substitutes. The fractions distilled over at from 150° to 200° C. can be employed as turpentine substitutes; while the fractions distilling over above 200° C. can be treated to form heavy oils, or can be re-introduced into the cycle of operations mixed with coal and nitrates.

Separating Tar and Ammonia from Gases.

Dr. C. Otto and Co., G.m.b.H., of Bochum, Germany.

No. 12,818; May 25, 1914. Convention date, June 28, 1913.

According to this invention, the crude gases are cooled and washed with cold water sprayed in the direction opposite to that in which the gases move. In the words of the patentees, the cold water entering from above washes the tar from the gases flowing in the opposite direction, and absorbs more and more ammonia on its way downwards until it arrives at about the middle part of the washer. In the lower part of the apparatus, in consequence of the action of the hot gases, the volatile ammonia is expelled again from the washing water, so that the latter finally issues from the washer charged only with fixed ammonia compounds. There is, therefore, formed in the middle part of the apparatus a zone where the washing water has as high a content of ammonia as possible under the conditions; and if water is continuously withdrawn from this zone at such a rate that the quantity of ammonia removed in it per unit time is substantially the same as is introduced during that time by the crude gases entering the washer, the process may be continuous. The water thus removed is separated from tar and led directly to a still to be further worked up in any known manner.



An Otto Company Tar and Ammonia Washer.

In order to avoid any loss of ammonia with the gases issuing from the upper part of the washer, there is arranged behind it a supplementary washer fed with a spray of cold fresh water, the quantity of which may be so measured that it corresponds with the quantity of water passed into the still, if the amount of water corresponding with that precipitated in the process is entirely evaporated on the cooling tower. The water running over the cooling tower becomes richer in fixed ammonia compounds; and as it is used again as washing water, a portion is always conducted into the still with the water passing therein. "Both the volatile and fixed ammonia compounds are therefore recovered substantially entirely, except for unavoidable losses."

The main advantages of the process are: "Simple and cheap apparatus, smaller requirement of power as compared with the so-called direct process (as large saturators are avoided), less effluent as compared with the old indirect process, and less resistance in the apparatus."

The hot crude gases enter the washer B by the pipe A and leave through the pipe C. Through the pipe D cold water is sprayed into the gases from above, which water separates tar and ammonia from the oppositely flowing gases. At a middle zone E of the washer, the washing water possesses the highest content of ammonia; and from this place a part of the water is withdrawn through the pipe F. After separation of the tar in the tar-separator G, the water enters the still H, where it is distilled (in known manner, with the addition of lime), and the ammonia passes through the pipe I into the saturator K, wherein ammonium sulphate is formed.

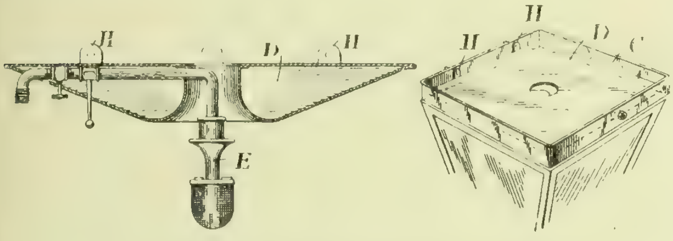
The hot water flowing from the bottom of the washer B through the pipe L is separated from the tar in the separator M, and the tar-free water is pumped by the pump N to the cooling tower O. Here such a quantity of water should be evaporated as corresponds approximately with the quantity introduced into the process by the coal. A part of the cooled water is continuously forced by the pump P back to the washer B. In the pipe C there is preferably inserted a supplementary washer [not shown], in which there is a spray of cold fresh water or acidified water, in order to separate the last traces of ammonia from the gases.

Gas-Lamps.

British Graetzin Light, Limited, and Meads, H. J., of Chapter Street, Westminster.

No. 13,215; May 29, 1914.

This invention consists in the combination in a gas-lamp of a reflector with means for securing it in the lamp-casing comprising lateral projections on the reflector which engage perforations formed in the lamp-casing itself.



Meads' (British Graetzin Light Company) Gas-Lamp.

The illustration shows, in section, the general construction of the reflector, and a perspective view of a lamp with the top removed and the reflector inserted in position.

The particular feature of the invention is the means for securing the reflector D in place in the lamp-casing. It is provided at each edge with lugs H provided with pins extending laterally in a direction outwards from the reflector. When the reflector is to be mounted in the lamp casing, it is only necessary to form holes in the flanged portion C in positions corresponding to the pins.

The tube which supports the burner-mouth E extends from the centre of the reflector to one corner, and where bent over to pass through the reflecting surface is provided with a screw nipple connection. The gas supply pipe extends up the inside of the casing to connect with the burner-tube.

It will be appreciated, the patentees remark, that the invention provides simple means for converting a lamp from (say) an upright incandescent burner to an inverted burner, since all that is necessary is to punch three holes in the lamp-casing, insert the reflector, tighten up the fastenings, and connect the burner-tube.

Producing a Gas-Tight Membrane.

Deutsche Gasgluhlicht Aktiengesellschaft (Auergesellschaft), of Berlin.

No. 14,230; June 12, 1914. Convention date, Aug. 6, 1913.

This invention relates to a gas-tight membrane (and to the process of producing it), consisting of oiled sheets or skins of micro-organisms (bacteria, hyphomycetes, &c.) produced by the accretion of micro-organisms on suitable substances—*e.g.*, wort.

The skins are first washed in water, and the superfluous water pressed out. They are then either treated directly with oil or are introduced into an emulsion consisting of oil and an albumen solution. Good results are said to be obtained by the use of linseed oil and animal glue.

In order to prevent the skins cracking, there should be added to the linseed oil a small quantity of non-drying oil—such, for example, as vaseline oil. The emulsion is preferably produced by adding to the substances used to form the emulsion a few drops of an alcoholic potash, linseed oil soap, and thoroughly stirring or shaking and heating the mixture—the addition of the soap producing a very fine emulsion. The flexibility of the skins is increased by adding to the emulsion some glycerine or, in order to avoid any hygroscopicity, a solution of a soft soap. After the skins have been oiled or have been left for a short time in the emulsion, they are squeezed and dried in the air.

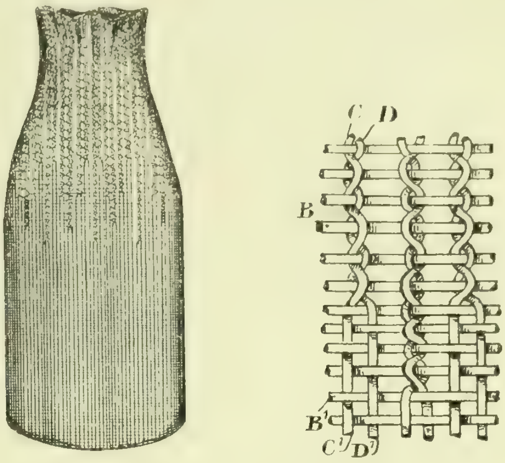
In order to produce thin and light membranes which, in spite of their thinness and weight, are gas-tight and strong, the skins, before being oiled or introduced into the emulsion, are subjected to a mercerizing process by means of alkalies.

Mantle Fabric for Incandescent Lights.

Gareis, O., of Berlin.

No. 16,046. July 6, 1914.

This invention has reference to an incandescent mantle, the head of which is made with greater qualities of resistance than the remainder, "as experience shows that the incandescent head, where the fabric is gathered in and on which the mantle hangs, is exposed to damage most easily inflicted, and it is at this spot where breakage of the mantle most frequently takes place."



Gareis' Incandescent Mantle.

An illustration is given of the method of making a mantle fabric of the kind referred to, and a portion on a larger scale of the fabric at the junction between the two kinds of fabric employed.

It is seen that every adjacent two-warp threads C and D are crossed or looped together, and the woof threads B pass through the loops formed by the crossed threads. In the lower or main portion, the fabric is a simple canvas or cambric one in which the warp threads C^1 D^1 lie straight and parallel to one another, and the woof threads B^1 pass through the warp threads from back to front and front to back.

A mantle made from this fabric has at its head, it is said, a capacity for resistance equal to that of a mantle made wholly from looped or gauze fabric; while at the same time it has, at the place which is of most account for lighting purposes, an illuminating power equal to that of a mantle made wholly from fabric of the canvas kind. "The fact that the incandescent head is made from a fabric which gives less illuminating power is no detriment, as it is known that the head of the mantle is of slight importance for the diffusion of light."

Prepayment Attachments of Gas-Meters.

Thorp, F., of Whitefield, and Thorp, H. T., of Prestwich, near Manchester.

No. 18,313; Aug. 7, 1915.

This invention has for its object "to produce a mechanism whereby various sized coins may be used with the same apparatus and the equivalent amount of gas given." The invention can, it is said, be applied to various types of coin attachments, "the method varying slightly according to the different mechanical means employed in the attachment." The patentees do not claim the general principle of changing gears, but say that "hitherto no simple effective means applicable to modern attachments of doing this have been employed."

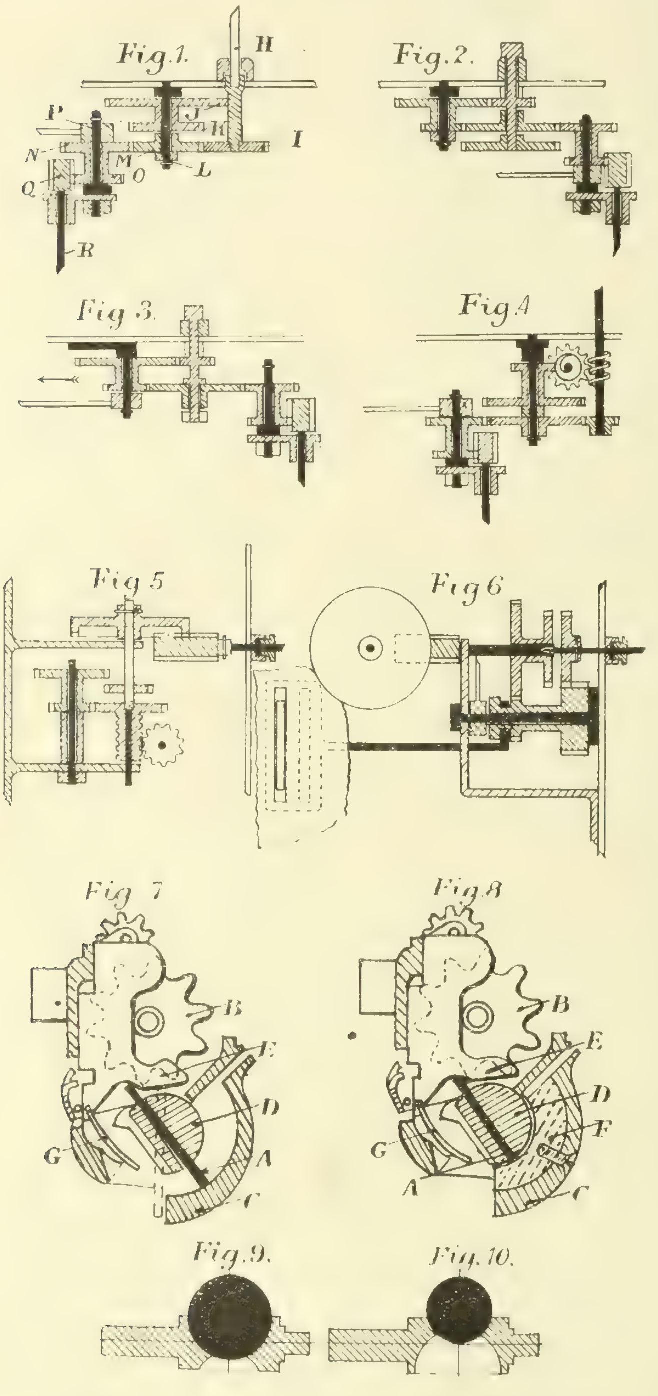
Figs. 1 to 6 [p. 460] illustrate devices for conveying the movement of the meter to the attachment so that the valve can be closed at rates corresponding to the value of the coin used. Figs. 7 to 10 show devices which may be employed to cause the coin, of whatever size it may be, to move a toothed wheel (which causes the valve to open) one tooth for each coin.

For the purpose of illustrating the action of the invention, they describe the arrangement adapted in one form to patent No. 20,991 of 1912, when the coin actuates a toothed wheel to which is attached a crown wheel, which gears into a small pinion carried by a wheel actuating the valve arm. The coin moving the toothed wheel one tooth through the gearing opens the valve; while the meter, through the index and special gearing, moves the wheel (which actuates the valve arm) in the opposite direction, and so closes the valve.

They show how two coins—1d. and 1s.—can be used, and the corresponding value of gas given. In figs. 7 and 8, A represents the coin in the position of engaging with a tooth in the wheel B. In fig. 7 the edge of the coin opposite the point engaging with the toothed wheel is in contact with the guide C, which keeps the penny pressed against the tooth until it has moved the wheel one tooth. The penny will then have been turned to the position shown by the dotted line, and fall out of the carrier D, or be pressed out by the lever E. If in place of the penny a smaller coin were inserted—say, a shilling—the diameter would be insufficient for the edge to engage in the tooth wheel when the opposite edge was in contact with the guide C. They therefore employ (as fig. 8) a making-up piece F, such that the diameter of the small coin, *plus* the thickness of the making-up piece, are equal to the diameter of the large coin. This piece is loose, and can be affixed to the guide C by a screw or other suitable means when the small coin is to be used, and removed when the large coin is employed. To prevent the coins falling into the money-box before they have actuated the toothed wheel, a guide-piece G is arranged to catch the coin and guide it to the toothed wheel.

As the two coins cause the valve to open the same amount, irrespective of size or value, it is necessary that the meter closes the valve after a shorter or a longer period according to the value of the coin. In the case of a penny and a shilling, the valve must be closed at one-twelfth the rate when a shilling is used as would be the case when the penny is used. Fig. 1 shows one method of accomplishing this. H is the shaft actuated by the meter. It carries a pinion to which is attached a wheel I, gearing into the wheel J, which carries a wheel K. These latter wheels revolve on the shaft L; while the wheel M, which gears into the wheel I, also revolves on the shaft L. Wheels N and O are fixed together, and revolve on the shaft P—the wheel O gearing into the pinion Q. The shaft R, revolving in a carrier, carries the pinion Q and actuates the mechanism to close the valve.

For an example, the wheel I has 24 teeth; the wheel M, 24 teeth; the pinion of the wheel I, 3 teeth; the wheel J, 36 teeth; and the wheel K, 24 teeth. As wheels N, O, Q are common to each combination, it is only necessary to deal with those previously specified. As illustrated, the wheel N is actuated through the wheels M I, each having 24 teeth; the wheels J K revolving freely on the shaft L. This arrangement is for use when the penny is employed. If, now, the shilling is used, the wheel N must revolve at one-twelfth the rate.



Thorp's Prepayment Attachment for Gas-Meters.

The making-up piece is removed from its position on top of the wheel N, and placed under the wheel O—this raising the two wheels; and while the wheel O still remains in gear with the pinion Q, the wheel N has become disengaged with the wheel M, and geared into the wheel K. The pinion of the wheel I, having three teeth, gearing into the wheel J, having 36 teeth, causes the wheel K, having the same number of teeth as the wheel M, to revolve at one-twelfth the rate of the wheel, which revolves freely on the shaft L.

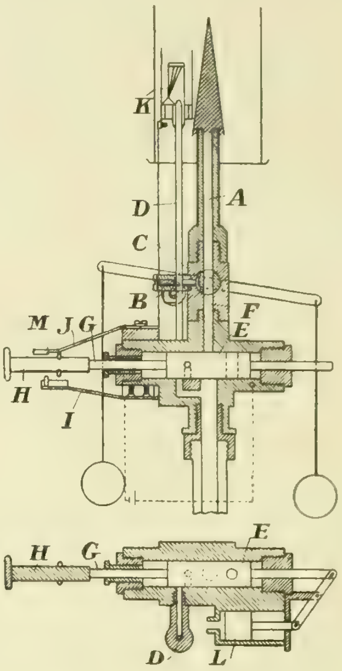
This description shows the application of the general principles of the invention; but, as previously mentioned, many devices can be employed to achieve the same object—see figs. 2 to 6—while in figs. 9 and 10 devices are shown to cause the coin, of whatever size it may be, to actuate the toothed wheel or other arrangement used to open the valve.

Igniting Gas-Lamps.

Rukop, A., of Brunswick, Germany.

No. 17,568; July 24, 1914.

This invention of a device for lighting gas-lamps, either at the spot or from a distance, consists in the provision of a pneumatically operated slide-valve which controls the gas supply to the burner and to a pilot-jet, and which, while supplying gas to the pilot-jet, closes an electric circuit for the ignition of the jet. The burner cock operates in the usual manner and feeds gas to the pilot-jet while the burner duct is closed.



Rukop's Gas-Lamp Igniter.

The burner shown consists of a tube screwed on to a cock casing, the duct of which is in communication with the duct A of the tube. The cock is operated in the usual manner by a double-armed lever with chains attached. As the lever turns, it depresses a spring-actuated stud B, the rounded head of which projects into the path of the lever. The stud retains the lever in both end positions and prevents accidental movement of the cock. The cock has a recess C, which, when the duct of the burner is closed, feeds gas to a pipe D leading to the pilot burner.

Underneath the casing a slide valve E is arranged at right angles to the duct F. The valve has two transverse ducts—one adapted to communicate with the pipe D, and the other with the duct F, when the position of the valve allows. One end of the valve E is connected to a rod (guided in a nut) which has its outer projecting end connected to a double-armed lever, the opposite end of which is connected to an air piston, through the medium of which the position of the valve can be adjusted. Another rod G, connected to the opposite end of the valve E, passes through a guide-bush adjustably held in a nut. The bush also serves as an abutment for the valve, the stroke of which can be regulated by its adjustment. Connected to the rod G is a cylinder H fitted with two contact-pieces, one of which is adapted, in a certain position of the valve, to engage contact pieces carried by resilient arms I J. A shoulder on one of the contact-pieces also forms an abutment, which, by engagement with the second of the contact-pieces named above, temporarily arrests the movement of the valve E. A wire connects the arm I with a battery; while the arm J is connected by a wire to a platinum filament K, which, when the circuit is closed, serves to ignite the pilot-jet.

Connected to the mouth of the cylinder of the air piston L is an air-pump, which may be placed at any suitable distance from the burner. When air is pumped into the cylinder, the piston will be moved to the right and the valve E to the left until the contact puts the ducts in communication and with the pipe D for supplying gas to the pilot-jet. At the same time the contact-piece moves, so that the circuit is closed and the pilot-jet ignited. A second actuation of the air pump forces the rounded contact past the shoulder M, so that the communication of the duct and contact-pieces is interrupted. At the second movement of the valve, however, the ducts are set into communication so as to feed gas to the burner.

Since the pilot-jet is only used during the short time required for lighting the lamp, no gas is wasted, it is pointed out, and the electric ignition element is at a sufficient distance from the heat zone not to be affected thereby.

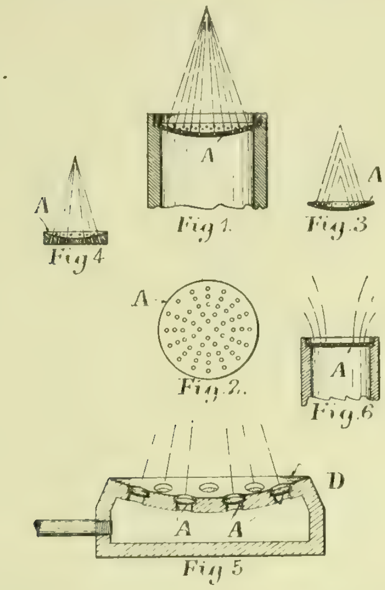
When, for any reason, the ignition apparatus is not in use, the lighting and extinguishing of the lamp can be effected by means of the cock and the lever; the valve E being then set so that the ducts are in constant communication. In this case, the pilot flame will always be on when the lamp flame is off.

Atmospheric Gas-Burners.

Wallwin, J. M., of Salford, and Sinnatt, F. S., of Manchester.

No. 19,073; Aug. 26, 1914.

The inventors claim, in burners for use in gas and air heated apparatus supplied with air at a pressure higher than that of the atmosphere, and wherein the gas and air are intimately mixed before reaching the burner and are regulated to ensure complete combustion on issuing from the burner, the use and application of a diaphragm or disc with a multiplicity of perforations arranged so as to cause the streams of gas and air as they leave the burner to collectively converge, and, in conjunction with the air pressure, cause the combustible mixture to burn close to the disc and produce a short flame cone without the need of secondary air.



Wallwin and Sinnatt's Atmospheric Gas-Burners.

Fig. 1 illustrates a longitudinal section of the burner, with the disc in cross section. Fig. 2 is a plan of the disc only. Figs. 3 and 4 are transverse sections of modifications of the disc. Fig. 5 illustrates a vertical section of a compound type of burner for use with crucible furnaces. Fig. 6 is a longitudinal section of a burner nozzle fitted with the old form of disc (this view being intended to show, by the chain lines, how the gas and air spread out on leaving the disc).

In figs. 1 and 2, the disc A is made of thin sheet metal (steel) drilled with a series of concentric rings of holes formed while the disc is flat —before being pressed by dies to "concavo-convex" section. When fixed in the burner nozzle, the disc is arranged with the concave face outermost, constituting the delivery side. The gas and air are supplied to the burner under pressure (capable of regulation) and mixed in suitable proportions before reaching the burner. This "mixture issues from the holes in minute streams, which, owing to the arrangement and inclination of the holes, converge towards a common focus as shown." Further, with the air supplied under pressure, the flame cone is short; and "owing to the gas and air being intimately mixed, as usual before reaching the disc, the mixture burns close up to the disc, and no secondary air is required." The pressure of the air used would preferably be not less than 2 lbs. per square inch.

As shown in fig. 6, the disc is flat on its outer face, and the holes parallel to each other, with the result that the gas and air, on issuing from the disc and at the moment of ignition, become sprayed outwards, thereby causing portions of unburnt gas to escape into the atmosphere. This, at least from close observation, appears to be what takes place, the patentees remark; but whether the fact is as stated or not, the effect of inclining the holes towards each other (see fig. 1) is to prevent the escape of unburnt gas when the burner is used in heating pressing irons and the like, and also to increase the efficiency of the appliances.

The holes in the disc will preferably be all at right angles to the concave face of the disc, and thus converge towards a common focus. The inner rings of holes may, however, be formed at other than right angles to the face of the disc, and thus cause the streams of air and gas passing through them to converge at a point earlier than the streams passing through the outer ring of holes—see fig. 3. Instead of being made of metal, the disc may be made of steatite or the like, in which case it may be of the cross section shown in fig. 4.

In fig. 5, which shows the invention applied to a compound type of gas and air burner, the openings for the discs A are arranged in concentric rings and are inclined towards a common centre line. For this purpose the holder D is made concave on its top face, instead of flat. With the burner discs arranged in rings and parallel to the concave face of the holder, the several flames are said to collectively produce, or tend to produce, a single large, but comparatively short, flame cone.

Hoisting Mechanism.

ROBERT DEMPSTER AND SONS, LIMITED, and HARGREAVES, W., of Elland, Yorks.

No. 23,408; Dec. 2, 1914.

This invention relates to hoisting mechanism for use in cranes, telphers, and the like, working with grabs, skips, &c., where auxiliary ropes or chains are required for opening the grabs or skips. Auxiliary ropes or chains have previously been operated by an auxiliary barrel; but, according to this invention, the auxiliary barrel is combined with the main barrel in the form of a sleeve mounted upon the main barrel and free to revolve on it; a frictional drive sufficient to lift the weight of the auxiliary rope or chain being imparted from the main barrel to the auxiliary barrel, which latter has an independent brake.

Gas-Burners.

YATES, H. JAMES, and DAVY, J. F., of Aston, Birmingham.

No. 548; Jan. 13, 1915.

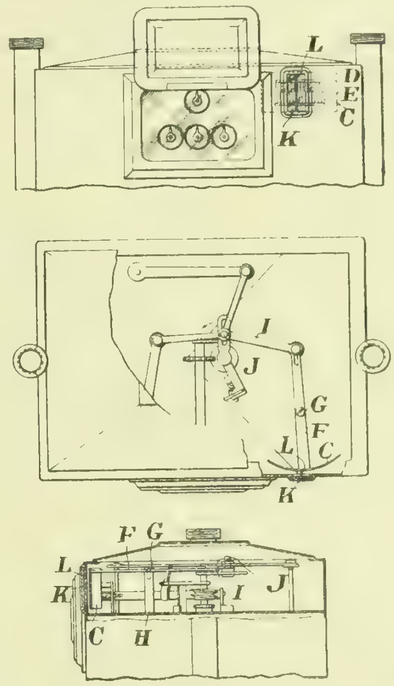
This invention relates to gas-burners employed in various forms of heating apparatus, and more especially to the burners used in conjunction with gas-fires. The object aimed at is to provide "an improved combined gas-nozzle and perforated tube for detachable insertion in the outlet aperture, or each of the outlet apertures, of a gas-burner." The invention comprises a tube closed at one end and formed with perforations closely arranged around its cylindrical part, and a nozzle which is secured to the open end of the tube and formed with an outlet aperture of smaller diameter than the tube. [Further particulars of the invention were given in the "JOURNAL," *ante*, p. 24.]

Indicating Leakage in Gas-Meters.

METROPOLITAN GAS-METERS, LIMITED, and FORSTER, J. D., of Nottingham.

No. 4984; March 31, 1915.

This means for giving in a gas-meter visible indication of a leakage of gas comprises a scale (graduated into divisions representing consumptions of a fraction of a cubic foot of gas) designed to be moved in front of a fixed pointer in a window provided in the meter casing, "its movement being effected from the meter mechanism and being of such magnitude that an appreciably visible movement of the scale is indicated for even a slight leakage of gas."



Forster's (Metropolitan Gas-Meters) Meter Leakage Indicator.

C is the leak-indicating scale graduated by vertical division lines DE, of different colours in order to facilitate the reading of the movement of the scale—the divisions representing (say) 0·002 cubic foot. F is the arm which carries the scale at one end—being pivotally mounted at G upon a pillar H rigidly secured in the attic of the meter. Its other end is connected to one end of the link I, the other end of which is pivoted to the crank pin J, to which are connected the two links of the meter mechanism, and which engages a tangent in the usual way. K is the window in the meter casing behind which the scale is designed to be reciprocated; and L is a fixed pointer fitted vertically in the window.

Should there be any leakage in an installation provided with a meter as described, it will cause a movement of the scale C in front of the pointer L—the movement being of sufficient magnitude to be clearly visible even when the leakage is only slight; and as the divisions represent a predetermined quantity of gas, the extent of a leakage can be readily ascertained.

APPLICATIONS FOR LETTERS PATENT.

11,826.—GWYNNES, LTD., and BREEZE, J. F., "Water supply." Aug. 16.

11,854.—SUTTON, C. J., "Gas-mantles." Aug. 17.

11,889.—HOLLY, C., and DRUCQUER, W. H., "Gas-fittings." Aug. 17.

11,909.—DONALDSON, J., "Conveyors." Aug. 18.

11,911.—GIBBONS BROS., LTD., and CLARK, F. W., "Regenerative chambers." Aug. 18.

11,937.—GLOVER, S., and WEST, J., "Discharging vertical retorts." Aug. 18.

11,942.—GLOVER, S., and WEST, J., "Discharging vertical retorts." Aug. 18.

12,068.—FLETCHER, RUSSELL, AND CO., LTD, and BANKS, W., "Gas-fires." Aug. 21.

The demand for glass goods of all descriptions in the Midlands continues very good. Flint-glass makers have received very important contracts for the supply of lighting glass during the coming autumn and winter; and there is considerable business in other directions. The export trade maintains fair proportions.

MISCELLANEOUS NEWS.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held on Friday, at the offices, No. 5, Great Winchester Street, E.C.—Mr. A. M. Paddon, M.Inst.C.E., the Chairman, presiding.

The Secretary (Mr. E. L. Burton, F.S.A.A.) read the notice convening the meeting; and the report [*ante*, p. 413] and statement of accounts were taken as read.

The Chairman proceeded to move the adoption of the report and accounts, prefacing what he had to say with the remark that he did not suppose any of the proprietors had attended the meeting in a very exacting spirit. Nevertheless, if any among them should have done so, he did not believe the keenest scrutiny and criticism would reveal anything whatever in the accounts which was not of a satisfactory character.

A RECORD INCREASE IN SALES.

Dealing first of all with the report, it would be seen that there had in the half year under review been an increase in the sales of gas of over 50 million cubic feet, which was the largest increase that had ever been recorded in the history of the Company in connection with a single half year. It amounted to 6·8 per cent. And the succeeding figure in the report was really a corollary of the first; for it showed a very important increase in the receipts from residuals. Of course, this was mainly due to the larger amount of business done; but it was also partly due to an improvement in the price of the residuals sold. The report went on to indicate that, in common with most gas undertakings, they had been compelled to increase the price of gas; but he thought the proprietors would agree with him, as the consumers had done, that the increase, under all the circumstances of the case, was a modest one. It amounted to only 3d. per 1000 cubic feet; and, as far as the present accounts were concerned, the Company had only had the benefit of the increase since March, and therefore in the leanest quarter of the year.

FIGURES WHICH ARE A CREDIT TO THE ADMINISTRATION.

There was brought to the aid of the present accounts from the previous half year a sum of £35,711; and after they had dealt with the various matters to which it would be his duty to call their immediate attention, they emerged with a carry-forward amounting to £36,613, which was a considerable increase. As a matter of fact, any increase whatever, at this time of trouble, must be a subject of congratulation, and of some credit to the administration of the Company. ["Hear, hear."] Turning to the accounts relating to capital, these showed that they had yet to issue over £130,000 of capital, when it might be required. Thus, they were still well provided for in this regard. The capital receipts totalled £703,378; and the important point about this figure was that it represented capital to the extent of £468 per million cubic feet of gas sold per annum—the lowest figure at which it had ever stood in the history of the Company. The proprietors had often heard him remark on these occasions that this figure was the most important one in connection with the accounts of a gas company. But, of course, they might have a very good figure of this kind in connection with a very bad state of affairs. They might have very little capital to issue, and very little land; and the plant might be in an unsatisfactory condition. Therefore the proprietors must consider, in connection with this figure of £468 per million cubic feet of gas sold, that the Company had very ample assets in the shape of land, that the works were in first-class order, and that the distributing plant was thoroughly up-to-date and efficient. These were the things which went to give the figure its real significance as a matter of comparison. There had been expended upon new meters during the half year the sum of £2532, but at the same time, on the score of depreciation, there had been written off £2700; so that their position was slightly more favourable by a comparison of these two figures. As to the redemption of capital under the powers of their Act of 1910, it would hardly be expected that the Board would have exercised these powers in the circumstances of the half year now under review; and therefore the matter stood as it did before, representing a permanent reduction which it had not been possible to increase during the past six months.

COST OF COAL AND FREIGHT TROUBLES.

Coming to the revenue account, which was the most important of all, because it explained how the results to which he had referred had been obtained, and determined their merits, it might be said that coal had only cost £1023 more, notwithstanding the very large increase in the output of gas. In fact, the cost per ton had only risen from 18s. 7¼d. to 19s. 1½d.; and this would clearly indicate to the shareholders that the full burden of the adverse circumstances by which they were surrounded had yet to be reflected on the accounts. It was characteristic of the gas industry that bad times did not declare themselves at once. For one thing, there was the question of contracts, which staved off the evil day. The burden, of course, had to come; but often it had to be met after the proprietors had forgotten all about the matter. He did not think they would be likely to forget the present misfortunes; but he wanted them to realize that, in the matter of the accounts, they had yet to face the gravamen of the war and its consequences as they affected the Company.

ALLOWANCE FOR WEAR AND TEAR.

The items in the accounts dealing with maintenance and repair showed that the Company had extended the total to nearly 12½d. per 1000 cubic feet of gas. This made clear the all-important fact that they had not shown any profit which had not first been written-down to the fullest possible extent that might be required for the security and stability of the finances. He had only a few days ago been looking at the accounts of a very important Suburban Company, and saw that there was devoted to the same four items—namely, repairs and maintenance of works and plant, mains, meters, and stoves and fittings—only 8d. per 1000 cubic feet of gas. On this basis of finance, it was easy to get good results on revenue account; but the criterion of results was always what provision had been made for maintaining the efficiency of the plant, and whether there had been charged to capital things which might have gone to revenue. Of course, in their own case they might possibly have charged items improperly to revenue; but there were three Auditors, and anything which passed them there was no need to be afraid of. The 12½d. per 1000 cubic feet to which he had referred was a very good foundation for any profit; but there were other items also which needed to be considered in estimating merits. Bad debts had gone up £237; and it was, of course, past the ingenuity of any administration to keep bad debts down in these times. Then there was the question of the allowances to the dependants of the employees serving with His Majesty's forces. This amounted to £1392, which was a sheer addition to the account as stated a year ago. While dealing with this matter, he would like to say that, out of the total of 850 employees, 328, or 38 per cent., had joined the Forces. Now, the proprietors knew that the management did not select their men on the basis of military qualifications. Some were advanced in years, and others were young. Therefore it seemed to him that the percentage he had named was one of which the Company might very well be proud, whether as proprietors or as administrators. He was not including in this total men who were making munitions. The men he referred to were performing genuine service to their country by fighting at the front; and he was certain no proprietor would be desirous of curtailing the provision that had been made for their dependants.

CONSUMPTION AND PRICE.

As to the other side of the account, he had already stated that the increase in the quantity of gas sold amounted to over 50 million cubic feet. But, again, this was subject to some qualification. They had lost in public lighting more than 14 million feet. That was to say, they had sold for this purpose 14 million cubic feet less than they did a year ago; so that in normal times the increase would have amounted to something like 64 million feet. That they were able to show the increase they did in business, was due to the fact that there had been a large incursion of population owing to the military precautions taken around their district. It had also been considerably aided by the fact that they were even now selling gas at the very moderate figure of 2s. 11d. per 1000 cubic feet, which was less by 1d. than the price at which the premier Company of London were selling; and they were doing this under circumstances very much less favourable to the production of cheap gas. He sincerely hoped that the moderate increase to which he had referred would cover them during the war. No one could be sure; but the Directors had good reason to trust that no further increase would be necessary. Rentals of meters, stoves, and fittings had increased £759. Although this was a small figure, it was very important. If it was possible to show a continuous increase in connection with meters, stoves, and fittings, this was one of the very surest indications of the progress of a company. With regard to the receipts from residuals, he might remark that the profit through sulphate from ammoniacal liquor, though they did not work-up this liquor themselves, amounted to £8 4s. per 100 tons of coal. This figure was adopted because it afforded a comparison with other companies; and it showed they were doing nearly as well in these times without works as other undertakings were doing with works. The total receipts on revenue account were £13,921 more, and the expenditure £6877 more. In the profit and loss account, it would be seen that they had paid out of net revenue £433 on account of the Act of Parliament they recently obtained. This was a small sum for an Act which embodied various useful provisions for the Company. The next item was £2952 written off the investments of the Company, and taken out of the revenue account. This was a bold course. Very many other companies would like to do the same, but could not afford to. Their Company, however, had done it, and yet had left themselves with an addition to the carry-forward afterwards. This writing-down related to the special purposes fund, which embodied the older forms of fund—the insurance fund, and so forth. The reserve fund had been written-down; but, of course, they could not charge depreciation in this way in revenue, because it dealt with money which had already become the property of the proprietors. It was merely a book entry, and showed that they carried forward to the reserve fund securities equal to a value of £57,902; and in order to reduce it to this figure, they had had to write £10,523 off the amount brought in to the half year. He thought this was an expedient course to take, because these were not times in which one would wish to put before the proprietors or the public figures which did not show an intrinsic value. The figure now complied with the minimum rates as fixed by the Government. The capital redemption fund was suspended in its operation. The benefit fund account showed disbursements during the six months amounting to slightly under £600, whereas the Company had made provision to the extent of £700. There was an accumulated amount of £2339 to carry forward; and this being on deposit at the bank, it was not subject to depreciation. In the balance-sheet, there was only one matter to which he need call attention. This was an item on the credit side of £79,674 for prepayment meter fittings, stoves on hire, &c. To meet this, there was in the capital account a balance of £64,450—not adequate in itself, but going a long way as a set-off to it. These were the figures on which the report of the Directors had been based; and he ventured to say they indicated a very sound state of affairs, and one which enabled them to look forward with some degree of confidence to the future. The bright spots were the facts that they had a continuation of the increase in business, that their contracts had been made on as favourable terms as those of any other company, and that they had made all possible provision to meet the difficulties that confronted them. But, nevertheless, the risks attaching to the conduct of the Company's business were abnormally great at these times. They were practically dependent for their coal supply on the water route from Newcastle to Shoreham; and it was quite unnecessary for him to enlarge upon the risks attendant upon the transmission of coal in this manner. They could not, however, avail themselves of any other method; and they had limitations imposed on them by the nature of the port through which they took their coal. Only a certain size of steamer would serve them; and it was this fact which gave rise to anxiety in the minds of the Directors. They had done everything in their power to obtain all the freight possible, so as to increase their stock of coal against any evil day ; and they had brought them up to what would be in ordinary circumstances an entirely satisfactory figure. Their sole endeavour, however, was to accumulate coal against any possible eventuality in the future.

The Deputy-Chairman (Mr. G. W. Carey) formally seconded the motion for the adoption of the report and accounts.

Complimentary Remarks.

Mr. H. E. Jones said the accounts reflected the greatest credit on all concerned. The feature which struck him most in connection with the Company was the extraordinary improvement in the financial aspect, due to the very careful way in which the business had been administered during the last fifteen or twenty years. He recollected the time when the capital represented nearly double the amount per ton or per million cubic feet of gas that it represented to-day. This showed that, not only had capital been wisely spent—which he should expect from such a careful engineer as Mr. Cash—but also that a statesmanlike policy had been pursued in the administration of the Company. He had been pleased to hear the Chairman say the Company's price was low, as compared with other larger and better situated concerns. This showed, again, that the political administration had been what it should be. He noticed with gratification that the expenditure on upkeep was very considerable. Whether or not he happened to be responsible for the Suburban Company to which the Chairman had referred, he did not know ; but he thought any company spending 8d. per 1000 cubic feet on the items named did very well, and that any concern spending 1s. did (as the American said) "A darned sight better." He wished the circumstances of all of them admitted of such sound finance. Like all companies who had amalgamated and had had to shift their manufacturing works from one site to another, the capital of their Company was necessarily swollen for a good many years ; and this was a matter of concern to Mr. Paddon's father when he occupied the chair. That gentleman would have been as delighted as he (the speaker) was to know that under the present Chairman's close and attentive administration, and that of Mr. Cash, things had so much improved. The Secretary had only one fault—that he was almost too particular. He heartily supported the resolution, and hoped that before the meeting separated the proprietors would unite in giving that hearty vote of thanks to the Directors and officers which they so thoroughly well deserved.

The resolution was then unanimously carried.

The Dividends.

Proposed by the Chairman, and seconded by Mr. A. F. Phillips, dividends were declared for the half year at the statutory rates per annum of 6 per cent. on the "B" and 4 per cent. on the "C" preference stocks, and 10¾ per cent. on the original and 7¾ per cent. on the "A" ordinary stock—all less income-tax.

Votes of Thanks.

The Chairman, in proposing a vote of thanks to the officers, said he knew perfectly well that all he had previously stated must have gone to show that both the Board and the proprietors were much indebted to them for the very favourable report which had just been adopted. He had omitted to mention that he had before him some interesting figures with regard to carbonization ; but this omission was not to be regretted, for he was now in a position to give the information separately. The amount of gas sold per ton of coal carbonized by Mr. Cash and his staff was 13,141 cubic feet, and the gas unaccounted for was only 2·5 per cent. These two figures would stand well among others of the same kind ; but they were not arrived at in any haphazard manner. They were the subject of very careful measurement, registration, and checking, and were absolutely to be depended upon. This being so, no higher compliment could be paid to Mr. Cash than was reflected in these figures. With regard to Mr. Burton, who Mr. Jones, in his happy way, had referred to as being perhaps too particular, the only thing he could say was that they liked him all the better for this. All they desired to do was to present a case which would successfully withstand the fiercest light of publicity.

Mr. Dodgson seconded the vote, which was heartily passed.

Mr. Joseph Cash, in reply, remarked that the results of which they had heard that day had been obtained with the loyal co-operation of everyone connected with the Company. As the proprietors were aware from the statement made by the Chairman as to the number of men who were serving the King, they had during the six months been very short-handed at the works. But it was not exactly the number of men that affected the matter, so much as it was that those who had gone were the best men. These had to be in some way replaced by men perhaps older, or not so well qualified to do their work. Now came the results of those who were left. They turned round and manfully filled the gaps, taking up duties which in some cases they had never performed before ; and he was proud of what had been accomplished during this period of stress. They were also, every one of them, indebted to those who had gone to the front, and were serving the country in various ways. Fortunately, they had lost only two of them by death, and several wounded. The remainder he hoped would come back safe and sound when peace was restored.

Mr. Burton also responded. He remarked that 40 per cent. of his staff had gone to serve their country ; and he had had to take on untrained men in their places, which had made the work very much harder than was the case at other times.

The proceedings were brought to a close with a vote of thanks to the Chairman and Directors, which was accorded on the proposition of Mr. Jones, seconded by Mr. A. W. Oke.

Stroud Gas Company.—The report of the Directors of the Company for the last half year shows that the sales of gas per meter have increased 1,668,000 cubic feet over the corresponding period of last year, and that 68 new consumers have been added. To meet the increased cost of coal under the new contracts, the Directors have been obliged to raise the price of gas 3d. per 1000 cubic feet during the half year. The payment of the maximum statutory dividend of 5 per cent. per annum, less income-tax, is recommended.

EASTBOURNE GAS COMPANY.

The Annual Meeting without Dr. Jeffery.

The Annual Meeting of the Company was held on Monday of last week. In the absence of the Chairman (Dr. G. A. Jeffery, J.P.), Alderman J. C. Towner (the Deputy-Chairman) presided.

The Chairman, in opening the proceedings, said they must all feel very great regret at the absence of their venerable Chairman. He was not able to be present—not having fully recovered from the illness he had lately suffered from, and he thought it better under the circumstances not to attend. It was very painful to him (the Chairman) to have to take his place, because he believed he had occupied the position at the annual meetings for the past 55 years without a break. This was a great record. He proposed that an expression of the regret of all the stockholders at Dr. Jeffery's absence, together with an assurance of best wishes for his speedy return to good health, should be sent. The Secretary (Mr. Garrard) had a letter from Dr. Jeffery, which he would read, and then Mr. Garrard would give some details bearing upon the past year's working.

Mr. James S. Garrard, having read the letter from Dr. Jeffery, proceeded to give a statement explanatory of the Company's operations. In the course of it he said : In these war times we have spent as little capital as possible. Only £716 has been expended during the half year—mostly for meters and stoves. Our low expenditure of capital per million feet of gas made is, however, our best feature. In these hard times, it is a truism that low capital expenditure is one's salvation. The revenue account is a plain statement and tolerably easy to understand. Coals have cost over £5000 more than last year. In other words, they have cost us 26s. 6d. per ton, against 22s. last year. This increase of 4s. 6d. per ton adds to the cost of gas by 5d. per 1000 cubic feet. The war has brought other expenses upon us in the shape of a war bonus to the workmen who have stayed at home. Also payments to the wives and dependants of those who have joined His Majesty's forces. These amount to almost £1000 in the half year, and add nearly 1d. per 1000 cubic feet to the cost of the gas. A portion (£734) of these payments has, however, been charged to the "Special Purposes Fund." The extra cost of coal and additional payments to employees amount to about 6d. per 1000 cubic feet. But the officers of the Company have exerted themselves to effect economies in other ways ; so that by good working and the greatest care in all the spending departments we have been enabled to restrict the increased charges for gas to 2d. from January to March, and an additional 2d. from March to June. Passing from expenditure to income, the growth of the Company's business is at once seen. A year ago the increased sales of gas were 2½ per cent. During the past half year the increase has been 7½ per cent.—equal to nearly 20 million cubic feet of gas. The military camp and various hospitals have doubtless assisted ; but a general increase all round appears to support the view that dear fuel, and the prolonged periods of dullness and darkness, have contributed to a remarkable increase in the sales of gas. Added to this I am glad to report that the number of consumers has also grown. There are now 5463 ordinary and 6018 coin-meter consumers—making a total of 11,481, or an increase of 191. Hired stoves have increased from 9152 to 9516, an addition of 364. Residuals are, of course, always a very important factor. During the past half year the receipts from this source have exceeded by £1000 last year's returns. Most of this arises from the increased value of coke. Thus with the assistance of £500 transferred from the reserve fund the balance at the credit of the revenue account is enough, within a few pounds, to pay the dividend recommended.

The Chairman moved the adoption of the report.

Mr. C. F. Botley, in seconding, passed some friendly criticisms on certain of the accounts ; and, in referring to the undertaking generally, he said the business of the Company was splendid and he accounted himself fortunate to be an investor in it. Considering the very low price of gas, and the moderate increase made in the charge to consumers, the excellent results achieved were certainly very remarkable. The time would, however, come when fresh capital would be required, and this would entail a larger sum paid in dividend. It would be necessary, therefore, for the Directors to pursue a watchful policy, strengthening if possible the Company's financial position and trenching upon the reserves as slightly as possible.

The motion was carried, and the dividends recommended were declared—7⅜ per cent. per annum on the "A" stock, 5⅞ per cent. on the "B" stock, and 5 per cent. on the preference stock.

The retiring Directors and Auditor were re-elected. The latter, in returning thanks, paid a warm tribute to the staff, both at the office and at the works. He especially eulogized the devotion of Mr. Garrard, Mr. Jones, and Mr. Hammond, who were fortunate in being backed-up by an efficient and willing staff. The Chairman, in his response, said it might be a little consolation, perhaps, to the stockholders to know that at present they had 10,000 tons of coal in stock. When he told them that at one time during the year they were within a week of putting the town in darkness, they would understand what a relief it was that they had so large a quantity now on hand. In reply to a question, the Chairman said they consumed about 700 tons of coal a week ; so that they had sufficient to last them for 15 or 16 weeks.

It was next resolved—"That the Directors be paid a remuneration for the year ensuing of £1200, free of income-tax."

In response to a vote of thanks passed to the Directors, officers, and workmen for the care with which they had conducted the affairs of the Company,

Mr. Frank Jones (the Consulting Engineer) said he had heard a similar resolution submitted a great many times, not only there, but elsewhere ; and, speaking rather as a looker-on, he could confidently say the compliment was well deserved. He would say nothing about the Directors, whom they knew so well, and on whom they relied so implicitly ; but with regard to the other officials and the staff, he could honestly say they were entitled to all the grateful and appreciative things they could shower upon them. Night and morning he had visited the Company's offices and works ; and, although his visits were irregular and casual, he never failed to find the officials and staffs sedulously employed. He referred particularly to the labours of Mr. Garrard and Mr. Hammond, observing with regard to the latter that, though handicapped by shortage of men, their new Manager had proved himself fully equal to his responsibilities.

Mr. GARRARD, who also replied, read an extract from the Consulting Engineer's half-yearly report to the Directors: "Generally speaking, I think the Board are justified in being satisfied with the half-year's working, when one looks to the fact that the past half year has been probably by a long way the most difficult one for conducting the works in the history of the Company. Different kinds of coal (ten to be precise), changes of foremen, shortage of men, and difficulties of supplies generally have given Mr. Garrard and Mr. Hammond a most anxious and hard task. But I hope during the present half year, with the more normal supplies of materials and the very large stocks which the Company now hold of coal and oil, that the figures will show an improvement in the make of gas per ton, the leakage, and the amount of sulphate made." Mr. Garrard added that the co-partnership scheme had been well maintained. It had grown so vigorously that nearly every man in the Company's employ was now a co-partner, and sixty of them would become shareholders in a very few weeks—they having contributed sufficient to entitle them to be stockholders. The bonus granted to the workmen, supplementary to their wages, amounted to nearly £1100. The amount paid to the wives and children of workmen serving their country at the Front amounted to £125 a month. It not only meant useful help to wives and children, but created in the men and their families extraordinary feelings of affection and gratitude to the Directors and the Company generally, who took such deep interest in their welfare. There were in all about 70 men who had joined the Army and Navy.

A vote of thanks to the Chairman brought the meeting to a close.

BOURNEMOUTH GAS AND WATER COMPANY.

The Half-Yearly General Meeting of the Company was held last Friday, at the London Offices, No. 90, Cannon Street, E.C., Mr. G. CRISPE WHITELEY in the chair.

The SECRETARY (Mr. H. A. Plumb, F.C.A.) read the notice convening the meeting, and the Directors' report and the statement of accounts were taken as read.

A DIFFICULT AND ANXIOUS HALF YEAR.

The CHAIRMAN, in presenting the report and accounts for adoption, said he doubted whether, in the whole history of the Company, those concerned in its administration had ever had a more anxious period to go through than during the last six months. To get coal at all—to get it at he could hardly say a reasonable price, but at a price of any kind, and to get it safely to Bournemouth, had required all the energy and enterprise of their Acting-Manager (Mr. P. G. G. Moon), and all the assistance that the Board could give him during the six months. Here let him (the Chairman) say that, in giving, on the ground of the strength and condition in which the Directors felt sure the staff was in, their consent to the Company's General Manager (Major Harold W. Woodall) to go and serve his country, they had been in every way fully justified. In all respects, Mr. Moon had risen to the occasion; and he and those associated with him had been enabled to do good work during a very difficult and anxious half year.

THE CAPITAL ACCOUNT AND NEW SANCTION.

A few words with reference to the accounts. On capital account, in June of last year, they had overspent by about £27,000; and now it would be seen that there was in hand something like £4000. The capital commitments were not in any sense of the word heavy. They consisted mainly in finishing a new holder, which was now almost completed. The debenture stock, amounting to £12,500, which they had authority to raise, would last, he hoped, for some little time. He should therefore explain that, in calling the extraordinary meeting at the close of the present one, at which the Directors were going to ask for additional capital powers, they were simply carrying on, he might almost say, the rule of the Company to be well ahead in these matters. In asking the proprietors to give their sanction to these additional powers, he might say that the Board did not propose to expend the money immediately, but they would call it up and spend it only as required, and with the greatest possible care. The Directors did not think this was a spending time. All the same, it was a precaution to be somewhat ahead in these matters, so that, if money was wanted, they would have authority to raise it. The Directors therefore desired powers to create, as required, capital stock to the amount of £25,000, with borrowing powers to the amount of £15,716.

A GOOD TRADING HALF YEAR.

The revenue account (he thought he might say), as he had had to say half year by half year ever since he had occupied the chair, was of the most satisfactory character, in spite of all their troubles and difficulties. They had had an increase of 9¾ per cent. in the sale of gas, and an increase of £700 in the water revenue. On the other hand, the public lighting had gone down. Bournemouth was now almost pitch-dark after eight o'clock in the evening, which was a most unsatisfactory condition from the Company's point of view, whatever it might be from the national point of view. What they had temporarily lost in this way, they had to make up in other ways. They had their camps, their soldiers, their hospitals, and their convalescent homes in connection with the war; and, in these and other ways, the Company had reaped a business advantage during the past six months which had made up, or partly made up, for their troubles and difficulties on the other side. Residuals, of course, had fetched higher and better prices, and partly made up for the loss occasioned by the enormous price they had had to pay for coal. So far so good.

THE PRICE OF GAS AND CO-PARTNERSHIP IN TROUBLES.

He could not speak very enthusiastically as to the future. They must anticipate, or be prepared to anticipate, difficulties. They could not keep for ever as sources of consumption the troops, hospitals, and convalescent homes; he trusted, at any rate, they would not have to do so. But the special advantages they had had during the past six months, they could not hope to maintain in the future. Then the increased price of coal had, as in the case of all, or nearly all, gas companies, necessitated an increase in the price of gas. All he could claim for the increase was that it was of the most moderate character of 4d.—an increase which, he thought, compared very favourably with that made by other companies. He hoped he could assure everybody concerned that the advance would be of the most temporary character. Directly the Board could see their way clear to get back to normal times, or anything like them, they would return to what he might call the normal price of gas. On the other hand, when troublous times came, an increase in the price of gas made everybody share in them—the proprietors were now suffering, the consumers were suffering, and the co-partners were suffering; and the special fund to which the Directors and officers had subscribed among themselves would also suffer. It was about the fairest way of proceeding, to ask all to do their share in paying for the additional cost that had come upon the Company. But, after all was said and done, the Board had a full statutory dividend to offer the proprietors; and, under the circumstances, he thought he might ask the proprietors to congratulate the Company, and everybody concerned, upon the results of the past half year's working.

THE RESERVE INVESTMENTS.

Before leaving the accounts, he should like to say a few words about the reserve fund. It now amounted to £60,000, of which £40,000 was invested in securities the value of which had fallen somewhat. But the Company were not obliged to sell these securities; and he thought they could look forward to normal times, or at least he hoped they could, when such loss as had occurred would be wiped off, or largely wiped off, by gains. There were £12,000 in Government securities at 2½ per cent. The Directors proposed to be patriotic, and to do what everybody was doing, convert these securities into War Loan.

THE MEN AND WAR WORK.

On more general matters, he need not detain the proprietors long, because, after all, the thing to do was the best they could in an emergency. The co-partnership was working most satisfactorily. He only the other day attended the annual meeting of the employee co-partners; and a more satisfactory meeting could not possibly have been held. The men were enthusiastic. There was an evident desire on their part to assist the Company to the full extent of their power in these anxious times, so that the concern could do well. Of course, the proprietors must bear in mind that labour unrest was very prevalent; and the temptations that the Government were offering now in the way of increased wages for special purposes was a very serious matter to deal with. But the men who were left to them had almost universally resisted the temptation. A large number of the men had left them to serve their country on land and sea; and some had fallen. All their employee co-partners considered they belonged to one family; and they had worked for, and had stood by, the Company loyally and firmly throughout all the temptation that had existed. But they were all anxious to do something for the country at the present time; and so, in connection with munitions work, the Directors had given the Acting General Manager almost *carte blanche* to do what he liked to assist the Government. He (the Chairman) was glad the Company had already obtained a contract for 3000 18 lb. shell cases; and that a special staff was at work every night upon their manufacture. This important war work had pleased the men; and he was sure he could say it would please the proprietors to know that not only were the Company able to do this, but they were also helping in the production of the raw material for high explosives. Thus they were justified in rejoicing that they were in the position to render material help in this time of national want and extremity.

A SAFE COAL STOCK.

The stock of coal, the proprietors would not be surprised to hear after what he had already said, was most satisfactory. They congratulated their Acting-Manager in having got through and over a great many of, if not all, the troubles, in this respect; and it was now hoped they could see safety in their position. He would not put it stronger than that.

AT THE FRONT.

The proprietors would be interested to hear, with regard to the war, that, acting in accordance with their wishes, the Board allowed all the members of their staff and men—starting with their General Manager (who was serving his country in India, and of whom they had splendid reports) downwards—who could be spared—perhaps even more than could be spared—to join His Majesty's Forces. Of the whole number, they had only lost one by death (and he thought this was really a source for congratulation), and thirteen had been wounded. The proprietors would be pleased to hear that the Company and the men had been represented in nearly every important action, both on sea and land, since the beginning of the war.

THE VACANCY IN THE AUDITORSHIP.

At the last half-yearly meeting, Mr. Benwell was re-elected an Auditor. Unfortunately, they had now lost him. The Directors expressed the greatest regret at his loss; for he did good active service for the Company for 24 years. The election of an Auditor to fill the vacancy was entirely in the hands of the proprietors. But the Board suggested (it was merely a suggestion on their part) that the most convenient plan—it was one that had been followed in connection with other companies—to save all the paraphernalia of anything like a contested election, would be to elect a small Committee of three or four proprietors to consider the appointment. They had already the names of three candidates; and if these gentlemen were willing to submit their claims to the Committee of Proprietors, there could be a nominal adjournment of the present meeting for a fortnight, when the gentleman recommended by the Committee would be appointed. In due course he should propose a resolution on the subject.

HOPEFULNESS IN STRENUOUS TIMES.

He did not think he need say more. All they could do now was to be hopeful. These were strenuous and terrible times. They could only do their best, as he thought the Directors could claim they had done during the past six months, and had presented the proprietors with, on the whole, a most satisfactory state of affairs. May it continue! He could promise, so far as the Board were concerned, and on behalf (he was sure) of the whole staff, that they would all continue to work on steadily and carefully to maintain the same position as far as possible that the Company had always held.

Sir Corbet Woodall seconded the motion, which was carried.

The Dividends.

Moved by the Chairman, and seconded by Sir Charles J. Jessel, Bart., the following dividends were declared, all less income-tax. At the rate of 6 per cent. per annum on the preference shares, 7 per cent. on the "B" ordinary shares, and 15 per cent. on the original shares.

The Auditorship.

The Chairman then proposed for election on the Committee, to determine the successor to the late Mr. J. C. Benwell as Auditor, Mr. Arthur Woods, of Messrs. Arthur Woods and Co. (Mr. Woods and his firm had been connected with the Company practically from the beginning), Mr. William A. Surridge, the Chairman of the Herne Bay Gas and Electricity Company, Limited, and Mr. H. Milner Willis, who had been a shareholder and connected with the Company for many years. It was proposed that these gentlemen should consider the several candidates' claims, and then report, at the adjourned meeting to be held that day fortnight, who they recommended for election. Their nominee would then be formally put before the adjourned meeting; and the Committee's selection would no doubt be ratified by the proprietors.

Mr. William Cash, F.C.A., seconded the motion. He remarked that this procedure was adopted, or suggested, by the Board, as one which would save both the candidates and the proprietors a good deal of discussion. The gentlemen named to serve on the Committee were all representative proprietors, and he thought the matter might be safely left in their hands. It was one in which the Board did not wish to take any part whatever.

The motion was unanimously carried.

The Chairman announced that there were at present three candidates: Mr. Glen, who was a chartered accountant, and son of a former Director; Mr. Sloman, partner of the late Mr. Benwell; and Mr. Jackson, of the firm of Messrs. Jackson, Pixley, and Co. He added that the remuneration of the Auditor was not a matter that would come up for consideration on this occasion. But the new Auditor would, until otherwise determined, have the same remuneration as Mr. Benwell.

Mr. E. L. Burton said he did not particularly care to enter into a competition for the auditorship; but he would put down his name and so make the number of candidates four.

Votes of Thanks.

The Chairman proposed that a very hearty vote of thanks be given to their Acting-Manager, their Secretary, the staffs, and the workmen. He said they all deserved these thanks. He had spoken of Mr. Moon, who had been most successful, through the energy and determination with which he had carried on the work. With this his (the Chairman's) colleagues all agreed; but Mr. Moon would tell them that he could not have accomplished what he had done had he not been assisted in every way by his staff. In Major Woodall's absence, he ought to say that he had left behind him a staff in a highly efficient condition. They could not forget their General Manager in his absence; and he in India was thinking of them that day. Regarding Mr. Plumb, as always he had done his work well, and never better than in the past difficult half year.

Mr. Burton seconded the motion; and it was heartily carried.

Mr. Plumb briefly acknowledged the vote.

Mr. Moon also thanked the Chairman, Directors, and proprietors on behalf of the Bournemouth staff and workmen. He observed that the Chairman and Directors had helped them tremendously. The Chairman had impressed the fact which must, of course, have been apparent, that any good work that had accrued had come entirely from the most loyal and cordial co-operation of every member of the staff and every employee. Their loyalty had been unswerving, and their energy splendid. The loyalty of the workmen was something that was very material, because there was, within five miles of the works, a big Government factory. The fact that the men in the face of this remained with the Company was considerable testimony to their loyalty. They had, as the Chairman had indicated, lost a few men who had not resisted the temptation. But he (Mr. Moon) was bound to admit that in these cases the temptation had not been one so much of money as a desire to feel that they were personally associated with something that was essentially war work. This was why he felt that the fact that they were now making shell cases, and were extracting toluol for ultimately filling these cases, had had a wonderful steadying effect (by producing a gratifying sense of helping the country) upon the whole staff. He should not like to reply to the vote of thanks without mentioning the name of their respected chief, Major Woodall, because the Bournemouth staff was one that he had chosen and trained; and if they were able to do the work acceptably in his absence, it was because he had so trained them, and left them to walk in well-defined paths, and according to a well-constructed policy. They had occasionally very happy letters from their chief, whose heart was with them though he was chained to India at the present time. One other matter. At the last meeting, it was suggested by the proprietors that it would be a happy thing to send a circular letter, accompanied by a small present—a postal order of 5s. was suggested—to their men who were away with the forces. These letters and orders were sent out as from the proprietors to some 160 to 180 of their men who were serving in various parts of the world; and in almost every case, interesting letters had been sent home by the recipients in which were expressed their cordial thanks.

Mr. Sloman asked to be allowed to thank the Chairman for his kind references to his late partner, Mr. Benwell.

Extraordinary Meeting.

An Extraordinary General Meeting was then held, for the purpose of considering resolutions authorizing the Directors to raise additional capital to the amount of £25,000, and debenture stock to the amount of £15,716.

On the motion of the Chairman, seconded by Mr. Cash, the necessary resolutions were passed.

The Chairman's acknowledgment concluded the proceedings.

GENEVA MUNICIPAL GAS SUPPLY.

Last Year's Statistics.

The accounts for the past year of the undertakings under the control of the Municipality of Geneva, which have lately been issued, furnish the following particulars in regard to the supply of gas. We are indebted for them to a recent number of the "Journal des Usines à Gaz."

The total consumption in 1914 was 13,980,770 cubic metres (about 493½ million cubic feet), which was 3·574 per cent. less than in the preceding year. The average consumption per day in the latter year was 39,723 cubic metres (1·40 million cubic feet), compared with 38,308 cubic metres (1 35 million cubic feet) in 1914. In the last five months of the two years the consumption (in cubic metres) was as follows:

	1913.		1914.
August	1,186,170	..	1,038,900
September	1,269,600	..	1,123,320
October	1,330,200	..	1,159,990
November	1,272,440	..	1,110,010
December	1,344,810	..	1,172,820
Total	6,403,220	..	5,605,040

The minimum daily consumption last year was in August (29,700 cubic metres); whereas in 1913 it was in March (29,360 cubic metres).

The quantity of coal gas manufactured was 11,771,100 cubic metres (415½ million cubic feet), and of carburetted water gas 2,210,860 cubic metres (78 million cubic feet); the proportion of the latter gas in the mixture being 15 81 per cent. In its production, 1,379,430 kilos. of coke and 684,351 kilos. of oil were used; being an average of 0 624 kilo. of coke and 0·31 kilo. of oil (equal to 1·37 lbs. and 0·68 lb. respectively) per cubic metre (35·3 cubic feet).

The average price of coal delivered on the works last year was 37 frs. 2 c. per metric ton, against 33 frs. 45 c. in 1913—an increase of 3 frs. 57 c. In stating this average price, account is taken of the large quantity of coal in store at the declaration of war. The average price of coal purchased in the first five months of the war and since has naturally been much higher than the 37 frs. 2 c. already mentioned. Before the war the coal came partly from the mines of Montrambert, Roche-la-Molière, Blanzy, and Aubin, in the North of France; but at the outbreak of hostilities the deliveries from these mines ceased. The works were then carried on with Thornley coal from England, and subsequently with supplies from the mines of the Ruhr and the Saar.

The gas produced last year was disposed of as follows:—

	Per Cent.
Consumed by meter	80·91
Lighting stairs and courtyards	2·30
Public lighting	6·74
Works and offices	1·18
Unaccounted for	8·87

The population of Geneva and the neighbouring communes, according to the last census, is 127,969; and the gas consumption works out to 109·2 cubic metres (3855 cubic feet) per inhabitant. The number of consumers is 34,286, or one to every 3·7 of the population. The number of meters in use is 35,066, and the consumption by this means amounts to about 329 cubic metres (11,600 cubic feet) per consumer and 88·4 cubic metres (3100 cubic feet) per inhabitant. In 1913 the latter figure was 91·7 cubic metres (3237 cubic feet). Though there was only a slight increase in the cost of coal in Geneva, compared with other places, in the last five months of the year, the average price of gas sold was higher by 2 c. per cubic metre (5½d. per 1000 cubic feet).

The old gas-works have been given up, and new ones erected at Châtelaine. Progress with them was impeded by the outbreak of the war; but they were brought into use in November, and appear to answer all expectations.

Installation of Gas in American Public Buildings.

The Supervising Architect of the United States Treasury has recently decided on the conditional piping of Government buildings for gas. The conditions are set forth in the following intimation: "As the result of a recent investigation, it has now been decided that, in the future, Federal buildings in large cities like New York, Chicago, Philadelphia, &c., will not be piped for gas unless the data show that the electric service is liable to interruption; and that buildings in smaller cities, where the electric service is liable to interruption, or where the cost of the current for lighting is more than 4 c. per K.W.H., will be piped for gas throughout, and combination gas and electric fixtures and gas brackets will be installed as part of the original lighting installation at such points as the exigencies of the service demand." In this connection, says the "Gas Record," it is interesting to note that the two most conspicuous buildings in the world—the Woolworth building in New York and the L. C. Smith building in Seattle (Washington)—are both equipped with full gas-piping throughout. The Woolworth building—the highest building in the world, 57 storeys high, with a floor area of 27 acres, and towering 750 feet in the air—has 43 miles, or 227,040 feet, of wrought-iron pipe in it. The L. C. Smith building—the highest building in the world outside of New York, with 42 storeys—has 17 miles, or 89,760 feet, of wrought-iron pipe in it. The gas companies in the larger cities have been for years consistently campaigning for the piping of all buildings; and their activities have been rewarded with practically complete success.

Damage to the extent of £2000 was done by a fire on Monday last at the works of Messrs. Sir William Arrol and Co., Limited, of Preston Street, Glasgow. A serious outbreak of fire took place at the Addiewell works of Young's Patent Paraffin Light and Mineral Oil Company, Limited, on Wednesday. The material damage was considerable; but no reliable estimate of it could be formed. It will take several weeks to replace the material destroyed; and it is said that, in all probability, the works will be idle for a time.

CHORLEY CORPORATION GAS DEPARTMENT.

Reduced Lighting, War Badges, and Coal Contracts.

Mr. J. W. Allin, the Engineer and Manager of the Chorley Corporation Gas-Works, presented a special report to the Town Council on Friday regarding economy in the public lighting of streets during the coming winter, showing how a saving of £380 could be effected under conditions which he described as considerably better than when working under the severe lighting restrictions arising out of the Defence of the Realm Act. He added that he thought the public would be prepared to accept with good grace any little inconvenience the reduced lighting might cause, seeing that the object was one of economy and saving, as had been suggested by the Local Government Board. He also proposed to supply to the men employed at the gas-works a private war badge, as mentioned at a previous meeting.

Mr. E. W. Heald (the Chairman of the Gas Committee), in moving the adoption of the minutes [including the foregoing], said a communication had now been received from the War Office stating that they proposed supplying war badges for men employed at the gas-works. There would be certain distinctions; but in the majority of cases the men would have the official badge. In the circumstances, he wondered whether it would be wise to let this portion of the minutes relating to war badges remain. Mr. Turner moved, as an amendment, that the reference be deleted. Mr. Sandham pointed out that it would be better to leave the minute as it originally stood, so that in the event of the War Office not supplying the badges the Gas Engineer would have power to deal with the matter. This was agreed to.

The minutes also showed that formal notice had been given to certain collieries under the Price of Coal (Limitation) Act, 1915, for an abatement, if necessary, in their contract price, so far as it exceeded the standard amount specified in the Act. Mr. Sandham said he hoped the Gas Committee would bear in mind, if they made a substantial income from this particular source, the increase in the price of gas that was recently made [see "JOURNAL" for June 29 last, p. 774], and to do all that lay within their power to reduce the price.

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CARDIFF PUBLIC LIGHTING ECONOMIES.

The Public Lighting Committee of the Cardiff Corporation met last Tuesday, and agreed to the principle of practically reducing the street-lamp service in gas and electricity by one-half, as from the commencement of September.

The CITY TREASURER (Mr. J. Allcock) reported, in conjunction with the City Engineer (Mr. W. Harpur), that, owing to the increase in the price of gas from June 30 last, the item of £3950 in the estimates for gas must be increased by £600, to £4550. By discontinuing the lighting of half the street gas-lamps during the second half of the year, however, a saving of £1187 would be effected, reducing the figure to £3363. It was also estimated that a reduction of part of £975 could be effected by stopping the provision of automatic lighting and extinguishing apparatus, by the reduced work of cleaning lamps, &c.; so that the total saving in street lighting by gas would approximate £1562. This figure is subject to several adjustments between the Corporation and the Gas Company.

The TOWN CLERK (Mr. J. L. Wheatley) stated that, under the contract with the Gas Company, a week's notice must be given of any proposed reduction in the number of street-lamps. It was accordingly decided to give the necessary notice in order that the reduced service should come into operation during the first week in September.

According to the original intention, the reduced service would come into force on Oct. 1; but the Committee adopted Alderman Thomas's view, that the new order of things should commence before the long nights came on, so that the public might be better able to accustom themselves to the change. A schedule of the lamps to be discontinued would be agreed between the Committee and the Gas Company.

Mr. ARTHUR ELLIS, with regard to the public electric lamps, recommended that all those put out at midnight under the present system should remain unlit throughout the next half year, and that other reductions should also be made in special streets. Calculated on an annual basis, the saving resulting from this discontinuance would amount to £2264; so that, with the gas-lighting reduction, the total economies, subject to adjustments, would approximate £3826.

It was decided to adopt Mr. Ellis's suggestions as from Sept. 1.

Owing to the advances in the price of coal and other outgoings, it was decided to add 12½ per cent. to the expenditure side of the accounts of the Electric Lighting Department, and to give notice to all customers, other than those under special contract, of an increase in the price of electric light commencing in October.

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According to the "Sanitary Record," during the first four months of this year the Milan works of the Italian Welsbach Company sent out 2,002,000 incandescent mantles, as against 900,000 in the same four months of 1914. The firm claim to have captured the whole market of Egypt and British India.

Mr. Alister R. Mackenzie, Assoc.M.Inst.C.E., of Vancouver, British Columbia, the eldest son of Mr. and Mrs. Mackenzie, of Erradale, Inverness, has just received a very important appointment from the Government of British Columbia. Some time ago it was determined to appoint a Royal Commission to investigate the irrigation troubles of the Province; and it was decided that the Commission should consist of one man only, an expert in water and hydraulic engineering. Last week this important appointment was offered to Mr. Mackenzie, who has accepted it, and embarks on his investigations forthwith. Mr. Mackenzie, after some years' experience in South Africa, proceeded to Vancouver, where he built up a large practice as a consulting civil and hydraulic engineer. He is also an expert in matters relating to water power and supply; and the Commission with which he has now been charged is a tribute to the high position which he has won for himself in the country of his adoption. Mr. Mackenzie's investigations will probably occupy him for seven or eight months, and will entail a thorough survey of the water problems of British Columbia.

GAS, WATER, AND ELECTRICITY AT BATLEY.

The abstract of accounts of the Batley Corporation for the year ended March 31 has recently been issued in a volume of more than 200 pages. Some interesting details prepared by the Borough Treasurer (Mr. R. G. Rutter) include tables showing the financial results of the working of the municipal undertakings during a period of ten years, and a useful summary of local statistics. The area of the borough is 3227 acres; the estimated population, 37,060; the rateable value, £181,500; and the product of a penny rate, about £650. In round figures, the municipal debt is £634,000, of which £455,000 is productive and £179,000 unproductive. The debt per head of the population exceeds £17; but more than £12 per head is invested in productive concerns. On the other side, there is a surplus of assets over liabilities of £12 per head; so that the net indebtedness is less than £5 for each resident.

From the gas undertaking £4650 was last year transferred in relief of rates; but the net profit realized was only £3524—leaving a deficit of £1126. Therefore the credit balance of £1373 with which the year was begun was reduced to £247. The gas-works, however, have been consistently remunerative; the net profits in each of the last ten years having been respectively—£4262, £4202, £4428, £2543, £3413, £6131, £5181, £5798, £4587, and £3524.

The year's accounts of the electricity works opened with a credit balance of £138. A net profit of £634 was made, giving a total available sum of £772, of which £714 was appropriated to liquidate the outlay on a new switchboard. Thus the amount remaining in hand was only £58. In five of the last ten years this department has been worked to financial advantage; the figures from 1905-6 to 1914-15 being: Loss £61, profit £494, profit £121, loss £307, profit £170, loss £127, loss £37, profit £1, loss £116, profit £634.

On the water-works there was a loss of £206; and as the previous year's deficit was £314, there is now a debit balance of £520. This department of municipal enterprise has not been attended with encouraging results. Taking the last ten years, the figures are: 1905-6, profit £1232; 1906-7, loss £2063; 1907-8, loss £1181; 1908-9, loss £2609; 1909-10, loss £2383; 1910-11, profit £962; 1911-12, loss £1136; 1912-13, profit £279; 1913-14, loss £530; 1914-15, loss £206.

The general balance-sheet shows that, compared with the previous year, the surplus of assets over liabilities increased by £23,596—from £428,269 to £451,865. The authorized borrowing powers of the Corporation amount to £1,209,047; and the actual borrowings have been £1,068,721—leaving a margin of £140,326. Nearly half of the borrowed money has been repaid; the total of the outstanding loans being £666,354. From loans and revenue accounts there has been a capital expenditure of £1,084,462—including £372,425 on the water-works, £194,739 on the gas-works, and £55,721 on the electricity undertaking.

From 1905-6 to 1908-9 inclusive the rates were 7s. 6d. in the pound. In 1909-10 they rose to 8s. 6d., in 1910-11 and 1911-12 they were 9s. In 1912-13 they were 9s. 7d., in 1913-14 they were 9s. 10d., and now they are 10s. In the same period the gas charges have been increased from 2s. 1d. per 1000 cubic feet to 2s. 7d., and the charges for water through meters from 6d. to 8d. and 9d. per 1000 gallons.

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SUGGESTED SUSPENSION OF SINKING FUNDS.

Reply by the Secretary for Scotland.

On more than one occasion, there has been reference in the pages of the "JOURNAL" to suggestions made that the Committee of the Scottish Convention of Royal Burghs should approach the Scottish Office to secure a suspension during the war of the sinking-fund provisions relating to gas undertakings. Eventually, the following suggestions were placed before the Secretary for Scotland by the Committee: (1) That in special cases the postponement of capital repayments by local authorities for reasons specially due to the war, and on good cause shown, might be favourably considered by the Scottish Office. (2) That the depreciation fund provisions of the various Acts of Parliament under which gas undertakings are administered should be suspended for the duration of the war, and until the first term of Whit Sunday occurring not earlier than one year after its close.

In his reply, the Secretary for Scotland says that he is fully sensible of the peculiar difficulties attending the financial administration of local authorities at the present time—difficulties which he knows are especially felt in relation to gas undertakings, in view of the enhanced prices which have had to be paid for coal supplies in recent years. Notwithstanding this, it appears to him that it would be most regrettable, even in a single case, to deviate from the sound rule that the current obligations of each year must be provided for and discharged as they arise, and not passed on to the ratepayer or consumer of subsequent years—who will have his own liabilities to bear, under circumstances of possibly greater financial stress than exist at this date. The present proposal of the Convention seems to proceed on the assumption that in the years which follow the war easier financial conditions will prevail. There may be some ground for expecting a certain measure of relief in the case of gas and other undertakings which are largely dependent on coal supplies; but (to select only one matter of importance) the fact that the war has necessitated borrowing on an unprecedented scale, which will mean enormously increased National Debt charges for many years to come, appears to preclude any general assumption of the nature indicated. He trusts, in all the circumstances, that the Convention will use their influence, in the general interest of local authorities, as well as the national interest, to secure that all statutory obligations in relation to sinking funds and depreciation funds—the postponement of which would merely mean heavier burdens on future years—shall be fully met as they arise.

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At the half-yearly general meeting of the British Gaslight Company, Limited, shortly to be held, the Directors propose to recommend, subject to audit, a dividend at the rate of 10 per cent. per annum, with a bonus of 2s. 6d. per share, for the half year ended June 30, both less income-tax, and payable in October.

WATER-WORKS EXTENSIONS AT HULL.

Stopped by the Treasury.

Last Thursday the Hull Corporation Water Committee held a special meeting to consider a letter received from the Local Government Board advising the Corporation to stop certain extensions of the water-works involving the expenditure of many thousands of pounds.

The letter stated that they had had under consideration the report of their Inspector (Mr. Fawcett), and the amounts sanctioned for the construction of certain water-works. These make a total of about £56,000. As regards the Dunswell works, amounting to £14,000, the Board say that these should be stopped at once, "except as to any lining required to make the well usuable by means of temporary pumping plant." The existing sources, it is added, can, with care, be made to suffice for some time to come.

Alderman T. Hall asked whether it was in the public interest to stop the works. He thought it might be possible to show that, in the course suggested, the public interest would be sacrificed.

The Chairman (Mr. Gaskell) replied that the Inspector went very fully into the situation, and was satisfied that Hull had an abundance of water to meet present demands. The matter had been reported to the Treasury; and the Treasury ordered them to stop the work.

Alderman Hall reminded the Committee that at the Local Government Board inquiry, when permission was sought to borrow the money, it was argued that, as Hull was getting very short of water, they were absolutely compelled to commit the Corporation to a very large capital outlay. The only difference in the position then and now was the difference in the depth of water in the wells at Cottingham and Springhead. When the application was made they had had a dry season; but since then they had had a wet season, and the water in the wells had risen. His own view was that they got into a panic when the application was made—they started in a panic, and they were, apparently, going to stop in a panic.

The Chairman said they had already a bore which had been opened out, and which could be available at any moment to get anything from half-a-million to a million gallons a day.

The matter was referred to the Chairman, the Deputy-Chairman, the Town Clerk, and the Water Engineer, with full power to order the contractors to stop the works, to take any further steps that might be advisable, and to report to the full Committee.

The action of the Treasury will not, it is said, affect the work in progress for taking Hull water to Withernsea. This scheme is practically completed.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Aug.* 30.

Growing interest is being displayed in pitch for export for the coming season. The value remains without change at 26s. per ton net, in bulk, at makers' works. Other values are: Creosote, 4¼d. per gallon, in bulk; 95-160 solvent naphtha, 2s. 1d. per gallon, naked; anthracene, 48-50 per cent., 2¼d. per unit, casks free—all at makers' works, net cash. Crude and crystal carbolic acid, toluol, and benzol, are, of course, controlled by the Government.

Twenty-five per cent. sulphate of ammonia is steady at £14 8s. 9d. per ton net, in buyers' bags, at makers' works.

Tar Products in the Provinces.

Aug. 30.

The markets for tar products have remained fairly steady during the last week. Very little business is reported in pitch, and contracts are almost at a standstill, owing to neither buyers nor sellers wishing to take the risk of freights. Solvent and heavy naphthas are in fair demand. Sales of creosote are still reported at reasonable prices.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 6d. to 25s. 6d. Pitch, East Coast, 22s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. Clyde. Benzol, 90 per cent., North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3d. to $3\frac{1}{16}$d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 6d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

Liverpool, *Aug.* 28.

In the early part of the week the market receded a little more, but towards the close there has been a slight improvement in the tone, and the loss sustained in values has been recovered. Having obtained fresh export licences, dealers have shown more disposition to make further purchases, but new foreign orders have not been much in evidence. To-day's quotations are £14 10s. per ton f.o.b. Hull, £14 11s. 3d. f.o.b. Liverpool, and £14 12s. 6d. f.o.b. Leith. In the forward position, the volume of business has not been large; but it has transpired that first-hand transactions have taken place f.o.b. good ports at £14 15s. per ton for October-December delivery, and at £14 17s. 6d. for January-March.

Nitrate of Soda.

Owing to scarcity on spot, prices have advanced rapidly this week, and holders now require 13s. 9d. per cwt. for ordinary, and 14s. for refined quality.

Sulphate of Ammonia.

From another source it is stated that the market for this article has been very quiet during the past week, and sales have been made at lower prices. Outside London, makes are quoted at £13 17s. 6d. to £14; Hull, £14 7s. 6d.; Liverpool, £14 10s. to £14 12s. 6d.; Leith, £14 15s.; Middlesbrough, £14 7s. 6d. to £14 10s.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is quiet, through the scarcity of ready steamers and the difficulty in getting licences for export coal. There is a good supply of fuel relatively, and buyers have been able to take advantage of the position in some cases. In the steam coal trade, best Northumbrians are from 19s. per ton f.o.b. for early shipment; second-class steams are dull at 16s. 9d. to 17s. per ton; while steam smalls are plentiful at 13s. 3d. to 14s. 6d. per ton, according to the quality. Work at the collieries seems to be steadier, except where difficulties in shipment intervene. In the gas coal trade, the home demand is increasing; but the foreign shipments are less, from the same causes that affect the steam coal trade. There is therefore ease in the quotations for this class also. Best Durham gas coals are 19s. to 19s. 6d. per ton f.o.b.; and second-class qualities are 17s. per ton. "Wear Specials" are also lower; but they may be said to be fairly steady at 21s. per ton f.o.b. Freights, however, are higher, and gas coal, Tyne to London, may be 7s. 9d. to 8s. per ton; but the rates are irregular, depending on the arrivals at the coal ports. A contract for some 20,000 tons of best Durham gas coals, for shipment over the next three months, is said to have been entered into at 20s. per ton f.o.b. But there is not much now doing in forward contracts, as buyers and sellers have varying views as to the prices forward. Gas coke appears to be stiffer in price; the supplies being still small to what is usual at this season. Good gas coke is quoted from 28s. to 29s. per ton f.o.b. on the Tyne.

Gas Explosion at Bradford.—Last week a gas explosion took place in Manningham, Bradford, due to one of the gas-mains having been pierced by some men engaged in laying a drain. The house concerned had been untenanted for a week, and when the occupiers returned they found it full of gas. A report of the matter was sent to the Town Hall; and meanwhile the explosion was caused by a neighbour, who entered the basement with a lighted taper, in order to turn off the gas.

Fleetwood Gas Company.—At the half-yearly meeting of the Company, a dividend of 5½ per cent. per annum was declared, being ½ per cent. below that of last year. The Vice-Chairman (Mr. T. Popple, J.P., of Heywood) said the higher cost of coal necessitated an increased charge for gas. Though this would ultimately mean a diminution of dividend, the Board felt it was the best policy in the interests of the Company to take the step at once, and make a reduction for the first half year, as well as applying the principle to the succeeding year.

Fatality at the South Metropolitan Gas-Works.—The Coroner's Jury who inquired into the death of Edward Wainer, a labourer at the Old Kent Road Gas-Works, in returning a verdict of "Accidental death," expressed the opinion that the place where the accident occurred should have been better protected. It was stated that he was assisting in some repairs in a retort-house, when he fell from the end of the staging down a hole. Some of the plates at the end of the staging had been removed to permit of the work being carried out. There was plenty of room for him to work without going to the end of the staging. The hole was guarded by trestles and a pole; but the spot where he fell was not. The staging was well lighted.

Morpeth Gas Company.—The annual report and balance-sheet of the Company for the year ended June states that the gross profits amounted to £1970, which, with the sum carried forward from last year, leaves £2249 available. The Directors recommend dividends making 5 per cent. for the year on the preference shares, and 5½ per cent. on the ordinary shares. The output of gas exceeded by a million cubic feet the record of last year. The continuance of the war necessitated restrictions in the lighting of business premises; and the suspension of public lighting naturally gave the Directors concern. But they trust that economy, together with the strong financial position of the Company, will enable them to tide over these difficult times without any diminution in the customary dividends. The Company have been called upon to provide another gasholder to meet the requirements of the town and district. This has necessitated the calling-up of the final 5s. per share on the new preference shares.

Price of Gas at Saffron Walden.—A lengthy discussion took place at a meeting of the Saffron Walden Town Council last week on the report of the Gas Committee, which stated that they had resolved to increase the price of gas from July 1 to 3s. 2d. per 1000 cubic feet. Mr. Miller moved an amendment to the effect that the price should be raised to 2s. 11d. He could not understand why the undertaking should charge consumers £1266 extra when the additional cost to the undertaking would only amount to £820. Last year the increase of gas sent out was 3,000,000 cubic feet; and the increase at present this year was somewhere about 13 per cent. If they put it at 10 per cent. on the rate of 2s. 9d., it worked out at £430, which would go a considerable way towards the £500 which the undertaking would not receive for public lighting. It was decided to refer the matter back to the Committee, to consider whether the price should be 2s. 11d., instead of 3s. 2d., as from Oct. 1, in view of the fact that some of the slot-meters had already been altered to the higher figure.

Mansfield Gas Undertaking.

It was intimated at the last meeting of the Mansfield Town Council that the yearly report which was in course of preparation regarding the gas undertaking was not yet ready. Mr. T. Smith (the Chairman of the Committee) stated that there was an inquiry in progress; and the report would be of a full and detailed character when presented. He hoped it would be shortly in the hands of members of the Council. The Committee had decided to increase the price of coke to 15s. per ton; this being 1s. 8d. a ton more than a year ago. But he added that this had not been brought about by any circumstances at the gas-works; it being entirely due to circumstances over which they had no control. They looked like losing £1000 on tar; and some steps would have to be taken to recoup themselves. Alderman Taylor proposed an amendment to the Gas Committee's report—"That the Town Clerk be instructed to communicate with the contractors supplying coal to the Gas Department, drawing their attention to the Price of Coal (Limitation) Act, 1915, and asking them if they were prepared to make any abatement in price." The amendment was adopted.

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Madrid Gas Supply.—The turnover of the Compaña Madrileña del Gas, of Madrid, for 1914, was 7,391,711 pesetas (£295,668), against 7,355,946 pesetas (£294,237) in 1913; the net profits amounting to 496,928 pesetas (£19,877), compared with 627,727 pesetas (£25,109) the preceding year.

Windsor Royal Gas Company.—In view of the half-yearly meeting called for the 22nd prox., the Directors have issued their report on their proceedings during the period January to June last. They state that the sale of gas showed a good increase over the corresponding half of 1914—partly to be accounted for by the large number of military billeted in the town. They add that, although many companies have been compelled to increase the price of gas, it is gratifying to the Directors to feel that for the present there is no occasion for the Windsor Company to do so. Their financial condition "indicates its continued prosperity," and the Directors propose that the statutory dividends be paid on all shares.

Harrow and Stanmore Gas Company.—This Company hold their half-yearly meeting next Monday. The report of the Directors for the half year to June 30 mentions that, throughout the past six months, coal and oil were obtained under favourable contracts made last year, and the price realized for coke was satisfactory. Owing to the "enormously increased prices" the Company will during the next twelve months have to pay for coal and all other materials required for the manufacture and distribution of gas, as well as the additional charges for labour, the Directors considered it advisable to increase the price of gas 2d. per 1000 cubic feet from Ladyday last. The balance standing to the credit of the profit and loss account is £12,090; and the Directors recommend dividends at the rate of 5½ per cent. per annum on the ordinary stock, and 5 per cent. per annum on the preference stock (both less income-tax), leaving £5318 to be carried forward.

War Bonus Question at Oldham.

The annual holidays of Oldham workpeople—known in Lancashire as "Oldham Wakes"—commenced last week-end, and will continue until next Saturday. The question of war bonus was, by agreement between the Gas-Workers' Union and the Municipal Employees Association, deferred until after the vacation. The Municipal Employees' Association representatives now express themselves willing to accept the 2s. per week proferred advance. On the other hand, however, Mr. J. R. Clynes, M.P. (the General Secretary of the Gas-Workers' Union), has expressed his willingness to accept 3s. advance. The position, therefore, is that the former body offer to settle on the basis of 2s. advance for each workman in receipt of less than 40s. per week; but the Gas-Workers' Union men still press their claim for an all-round advance of 3s. Another conference of Union representatives and the Special Committee of the Corporation has been asked for; and if this is refused, the men are to ballot on the question of a strike. It is suggested by Mr. Clynes that the conference should consist of six representatives of the Union, with an equal number of the Corporation; the view of the Union being that by means of such a conference terms of settlement might be discovered which both sides could accept. Mr. Clynes pointed out that the offer of 2s. per week advance was not accepted by the men, as it extended no advance to those receiving 30s. or more per week. His argument was that men who received 30s. or more were in most cases those whose wages were higher than others, not for ordinary service, but because of the exceptional arduousness of their work, and the special necessities which required them to work on varying shifts at all hours, and to work also on Saturdays and Sundays.

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A Gas Suicide Case.—Last Wednesday, at Hackney, there was a Coroner's inquiry relative to the death of a woman who dressed herself ready for burial before fixing a rubber tube in her mouth and turning on the gas tap to which it was attached. It was thought she had been fretting at the absence of her husband at Netley; and the Jury returned a verdict of "Suicide while of unsound mind."

Position of the North Warwickshire Water Company.—According to the "Birmingham Daily Post," public notice has been given that a petition has been presented to the Court, *re* the North Warwickshire Water Company, by the Mayor, aldermen, and citizens of Coventry, and will be heard in October. The Company obtained its first Act of Parliament nearly twenty years ago, and a second Act in 1900. Powers were given for supplying water in a number of villages; and several of them—including Foleshill, Meriden, Hampton-in-Arden, and Knowle—get water from the Company, whose works are at Keresley. When the City of Coventry was extended in 1899, the Corporation took over the Company's powers in the parishes affected by the extension, paying compensation for the acquisition. In later years, for a time, they supplied water in bulk to the Corporation, while recently the urban body has sold water to the Company.

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See "Journal" for May 25 and June 1 & 8 (pp. 471, 525, & 596).

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Chichester Gas Company.

It was reported at the half-yearly meeting of the Company that the balance standing to the credit of the profit and loss account, net revenue (after providing for the interest on the debenture stock, temporary loans, &c.), amounted to £1846, out of which the Directors recommended the declaration of a dividend for the six months to June 30 at the rate of 7 per cent. per annum upon the "A" capital stock, and £4 18s. per cent. per annum on the "B" and "C" capital stocks—all less income-tax. The figures in the accounts had been adversely affected by the restriction of lighting imposed by the military authorities. The Chairman (Mr. W. A. Walker) pointed out that the sales of gas had shrunk to the extent of 9 per cent.; while with regard to the chief residual products, for which they had entered into the usual annual contracts prior to the outbreak of war, they been deprived of the better prices obtainable, which were set up by the war conditions, so that they had been doubly hit. In common with almost every other company in the kingdom, the charge for gas had demanded careful consideration; and as from Oct. 1 last, the price was advanced 4d. per 1000 cubic feet. Whether or not this increase would suffice, would be a matter for the future to determine. The number of consumers had increased during the half year; but the average consumption per meter had decreased. The unaccounted-for gas had been reduced until it had reached the low figure of a fraction over 3 per cent. Five of the Company's employees were serving their King and country; and their places would be open for them at the end of the war. They were also allowing a war bonus to the workmen. The Manager (Mr. T. N. Ritson), replying to a vote of thanks, said the Company had a most loyal staff, and everything worked smoothly.

South Hants Water Company.—The half-yearly meeting of the Company was held on the 11th inst., at Southampton, with Captain A. J. Corse-Scott, J.P., in the chair. The rent roll had been increased in the six months to June by the connection of 246 houses, representing a rental of £206. There was a credit balance of £12,802 to be disposed of. The Company had been called upon to supply about 500,000 gallons of water a day for military purposes and hospitals; and as it was found that there was likely to be a considerable strain upon the resources of the Company through various camps being formed within the Company's district, it was decided to increase the carrying capacity of the Company's mains—a work that was nearly completed. Mr. A. W. Oke, commenting on the report, congratulated the Directors on the fact that in a very bad time they were able to place shares so well as they had done. He suggested, however, that it would meet the convenience of a large number of shareholders if the Directors would try the experiment of selling shares on the next occasion by tender—a course that had proved very successful with other companies, and these were days of economy. The Chairman intimated that the suggestion would have due consideration, and the report was adopted unanimously.

Barnsley Gas Company.

Presiding at the annual meeting of the Company last Thursday, Mr. E. G. Lancaster, when moving the report and accounts, said that when it was remembered that the balance-sheet covered eleven months of the war the shareholders must consider the results very satisfactory. The expenditure had gone up by £2105, of which coal accounted for one-third, or £738. The receipts side was both satisfactory and unsatisfactory. The sale of gas was satisfactory—showing an increase of 14 million feet, and £2782 in cash. But residuals had let them down to the extent of £786, or, with sundry deficiencies amounting to £187, a total of £973 to come off the receipts from the increased sale of gas—leaving £1809 to meet the increased expenditure. The result, however, enabled them to pay the usual dividends, with £29 over. The future was not very bright. Coal was going to cost them £5000 more, and residuals were going to let them down again. They had made their contracts, and on tar the loss would be £500, while on liquor the result would be no better than last year. Coke might just hold its own. With such a dark forecast, there was no alternative but to raise the price of gas; and, with grave reluctance, they had done so to the extent of 6d. per 1000 cubic feet. It might be some consolation to customers to know that financially the Company were better off with the old prices for coal and gas than they were with the new ones. They, however, still maintained that gas, even at its present price, was far cheaper than coal for cooking and heating purposes. The accounts showed a balance brought forward of £7579, expenditure £26,100, and receipts £33,698, leaving a balance of net profit to be carried forward of £5460, out of which the dividends have to be paid. The receipts cluded £27,165 by sales of gas, £444 public lighting and other contracts, £824 rent of meters, &c., and £6471 for residual products.

Cork Gas Consumers' Company.—The half-yearly report of the Company shows an increase in the revenue as compared with the corresponding half of 1914. This is attributed principally to the high price of coal, which induced consumers to use more gas for cooking, heating, power, &c. The cost of production is considerably higher than usual; but this is compensated for partly by the returns from residuals. After placing £905 to the depreciation fund, the balance of profit and loss is £5239. It is proposed to pay a dividend of 8 per cent. per annum.

Winchester Water and Gas Company.—The Directors report that special temporary supplies to the Military Authorities have been required throughout the past half year; and to this is attributable a large addition to revenue. At the same time, the continually increasing cost of coal, other materials, and labour, renders ample provision for the immediate future necessary. The balance of the net revenue account available for dividend is £10,518; and the Directors recommend the payment of a dividend on the preference stock at the rate of 4 per cent. per annum, and on the consolidated ordinary stock at the rate of 4½ per cent. per annum, less income-tax, for the half year.

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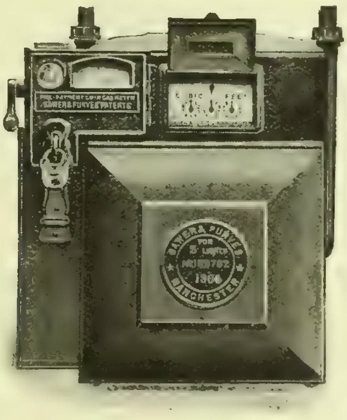

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North Middlesex Gas Company.

Compared with the results for the half year ended June 30, 1914, the sale of gas by the Company in the past six months shows an increase of 1,998,400 cubic feet, or 1·3 per cent.; but the revenue from residual products is £461 less, owing to a reduction of the quantity of coal carbonized. The Directors state that the serious difficulty of obtaining supplies of coal during the early part of the half year caused great anxiety; the contract being ultimately cancelled owing to the war. Purchases to cover requirements until the summer of 1916 had been made, but at a very considerable increase in the rates paid, the full effect of which has not yet been felt. The payment of war bonuses to the Company's servants, allowances made to the dependants of employees serving with the forces, and the enhanced cost of all material used by the Company, have entailed a very heavy burden upon the finances of the half year; and the Directors felt it necessary to raise the price of gas 2d. per 1000 cubic feet as from March 31. The net profits for the half year, after charging interest and income-tax, amount to £4678, which, with £4662 brought from the previous half year, makes the disposable balance £9341. At the meeting yesterday, the Directors recommended the declaration of dividends for the half year at the following rates: On the preference capital, 5 per cent. per annum; on the "original" ordinary capital, 11 per cent. per annum; on the "additional" ordinary capital, £7 14s. per cent. per annum. This appropriation will amount to £5373, and leave the reduced balance of £3967 to be carried to the profit and loss account for the current half year. The sum of £17,500 realized by the issue of 1250 "additional" ordinary shares has been credited to capital account.

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Colchester Gas Company.—Dividends at the rate of 10 per cent. on the old shares and 7 per cent. on the "B" shares were declared at the half-yearly meeting of the Company. The accounts which were adopted showed that the bank balance was £4384; cash in hand, £62; reserve fund investments, £5485; and stock of coal and materials, £4400. The receipts for gas-rental during the half year amounted to £13,891; meter-rental, £608; coke sold, £2130; tar, £1025; sulphate, £608; and bank interest, £58. The credit balance for the half year was £2446; and on the general account there was a credit balance of £13,440.

Lighting Regulations and Hotel Responsibilities.—The point was raised, before the Grantham Magistrates on Monday last week, as to the responsibility of hotel keepers for carrying out lighting regulations; Mr. John Fillingham being the defendant. A police witness spoke to seeing bright lights in three hotel windows at midnight on the 18th inst. The solicitor for the defence argued that, being a hotel, defendant could not be held responsible when the lights in the bedrooms were under the control of the guests, as in this instance. Mr. Fillingham explained that the persons stopping in the house were nearly all military men, to whom the regulations should have been well known; but a nominal fine of 2s. 6d. was imposed.

Southend Gas Company.

The report of the Directors for the half year ended at June 30, which was adopted at the half-yearly meeting of the shareholders last Tuesday, showed that, compared with the corresponding six months of last year, the sale of gas had decreased by 3,168,000 cubic feet, equal to 1·48 per cent., which in the circumstances was considered satisfactory. The number of consumers at June 30 was 18,548—an increase in the half year of 447. The number of automatic meters was 13,125; and during the six months 838 gas cookers were fixed. Mr. Francis Clark, their Engineer and Manager, had tendered his resignation, which was duly accepted by the Directors, who, in acknowledgment of his having served the Company for a period of over 38 years (for 31 years as Manager), had granted him a retiring allowance of £300 per annum. Mr. C. Stuart Shapley, of the Sheffield United Gas Company, had been appointed to the position, and took up his duties on June 16. In order to meet the increased cost of production of gas, arising chiefly from the high prices of coal, the Directors had been exercising every economy over the expenditure on the works and plant, consistent with the proper upkeep and efficiency; and after transferring the sum of £531 from the reserve fund account to the profit and loss account, the balance available for dividend was £7966. The Directors recommend payment of dividends for the half year on the original and new ordinary stocks at the rate of 5½ per cent. per annum, and on the new ordinary "B" stock at the rate of 5⅛ per cent. per annum (all less income-tax at 2s. 1d. in the pound), which amounted to £7496. The total mileage of mains was 80 miles 78 yards. In the absence of the Chairman (Lieut. C. F. Woosnam) on military duty, the adoption of the report was moved by Mr. James Randall, who presided. Dealing with the outlook for the future of the gas industry, he said it was none too rosy, yet there was every indication and promise that they need have no fear. Estimates had been laid before the Board and carefully considered; and it was felt that, by exercising the strictest economy, with improved working, and better prices for residuals, they would be able to pass through the current half year without increasing the price of gas—and this in spite of having to meet a very considerable increase in the price of coal. As referred to in the report, Mr. Francis Clark had resigned the position of Engineer and Manager to the Company, and Mr. C. S. Shapley had been appointed to fill the post. During the short time he had been with the Company, the Directors were thus far satisfied that they had secured the services of an efficient and energetic officer. The report was adopted, and the dividends recommended declared.

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Dearer Gas at Leeds.—The Leeds Corporation Gas Committee have decided to recommend that the price of gas for heating and lighting be increased 3d. per 1000 cubic feet from Oct. 1. In July the price was increased by 3d.; and this second rise will bring the charge to 2s. 8d. The increase in the cost of coal as compared with prices before the war will mean an addition of from £60,000 to £70,000 a year; and the war bonus will cost the Committee £4000 to £5000 per annum.

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Watford Gas Company.

The half-yearly meeting of the Company was presided over by Mr. E. J. Slinn (the Chairman), who pointed out that they had had another good six months. Pensions and war allowances stood at £584; but while they deplored the necessity for this expenditure, they were proud to bear their share of the national burden. Their eligible men had answered the call exceedingly well. The figures under the co-partnership scheme were somewhat reduced, in consequence of so many employees taking part in the greater co-partnership movement with our Allies, and partly because of the decreased bonus following on the increased price of gas. On the credit side of the revenue account, the results were first class. Sales of gas, hire of meters, cookers, and fires, and sale of residuals were all substantially increased; and they had sufficient to pay the statutory dividend and mortgage interest, and leave a little in hand. One thing they all regretted was the increase of 4d. per 1000 cubic feet in the price of gas; but the cause of this was well known. The report was adopted, and the statutory dividends were declared. The report stated that 42 of the Company's employees were with the forces. The revenue account showed a profit of £6607, and the profit and loss account £8948 available for distribution.

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Lea Bridge District Gas Company.—At to-day's half-yearly meeting of the Company, the Directors will report that the increased quantity of gas sold during the six months ended June 30, as compared with the corresponding period of 1914, was 5,285,500 cubic feet, equal to 2·26 per cent. The amount available for dividend (including the sum of £5952 brought forward) is £13,569; and from this the Directors recommend the declaration of dividends at the rates of 5 per cent. per annum on the 5 per cent. preference stock, and 6½ per cent. per annum on the consolidated ordinary stock, both less income-tax, and that £644 be placed to the credit of the reserve fund, leaving £5885 to be carried forward. On May 18, £5000 of additional capital was offered for sale by auction, and was all sold at £118 per £100 of stock.

Crowborough District Water Company.—Mr. W. A. Hounsom, who presided at the half-yearly meeting of the Crowborough (Sussex) District Water Company last Saturday week, remarked that as a statutory company they had obligations as well as privileges, and therefore had been unable to pass on to the consumers the increased cost of working. The receipts were £2698, as compared with £2444 in the corresponding six months of 1914; but the expenditure was considerably more, owing to the demands made by the military authorities at Crowborough Camp. The result was that they carried to profit and loss account a sum of £815, against £1082 last year. The number of supplies had increased by 138, to 2133, and 29 per cent. more water had been pumped than in 1914, which in normal circumstances would have left a sum approaching £1400 available. The Directors' report and statement of accounts were carried; and an interim dividend at the rate or 4½ per cent. per annum on the preference shares was declared.

Barnet District Gas and Water Company.—The report submitted at yesterday's half-yearly meeting stated that the balance standing to the credit of the profit and loss account amounted to £36,748, out of which the Directors recommended the declaration of a dividend, less income-tax, for the six months ended June 30 at the rates of 9 per cent. per annum on the "A" and "C" stocks, 8 per cent. per annum on the "B" stock, and £6 6s. per cent. per annum on the "D" gas and water stocks. The Directors regretted to have to announce that, owing to the increase in the price of coals and other materials, they were compelled to raise the price of gas from 3s. 2d. to 3s. 4d. per 1000 cubic feet from Lady-day last.

Hebden Bridge Board and War Risks.—The question of insuring their property against aircraft and bombardment risks was discussed at a meeting last week of the Hebden Bridge and Mytholmroyd Gas Board. It was finally resolved to take no action for the present. A circular letter was submitted from the Local Government Board appealing to the Gas Board to exercise strict economy in every possible way. The Manager (Mr. E. J. Wellens) reported that the consumption of gas was increasing, owing to the night shifts which were being run by firms on Government work. There would, however, be a probable decrease in the quantity of gas used for public lighting, as the Council had again decided to reduce the number of burning hours.

Farnworth and Kearsley Gas Company.—At the half-yearly meeting of the Company, it was pointed out by the Chairman (Mr. H. A. Barnes, M.A., J.P.) that they had not yet felt the full effects of the war, and profits were sufficient to pay the maximum dividend. The sale of gas had decreased to the extent of a little over 4 per cent.; but it was pleasing to record a further increase in the number of both ordinary and prepayment consumers. Coal had cost less than in the previous year, owing to advantageous contracts, which had, however, now terminated. In consequence of the increased price of more than 5s. per ton to be paid on the new contracts, they had been compelled to raise the price of gas 5d. per 1000 cubic feet. The works were now insured against air-craft risks. The report was adopted, and maximum dividends of 10 and 7 per cent. were declared.

Manchester Electrical Undertaking.—A notice of motion which there was not time to deal with at the last meeting of the Manchester City Council is on the *agenda* paper for discussion to-morrow (Wednesday). It is in the name of Mr. H. Ross Clyne, and proposes the appointment of a Special Committee to inquire into the working and control of the Electricity Department [*ante*, p. 256], and, in addition to empowering such Special Committee, to engage an independent expert (who it is suggested should be associated with the control of some large electrical concern) to advise them, the Committee are authorized to hear the views of citizens who may be either favourable or unfavourable to the policy, present or prospective, of the Electricity Committee. A further suggestion is that the Special Committee report to the City Council upon the necessity of certain proposals being proceeded with or postponed until after the present national financial strain.

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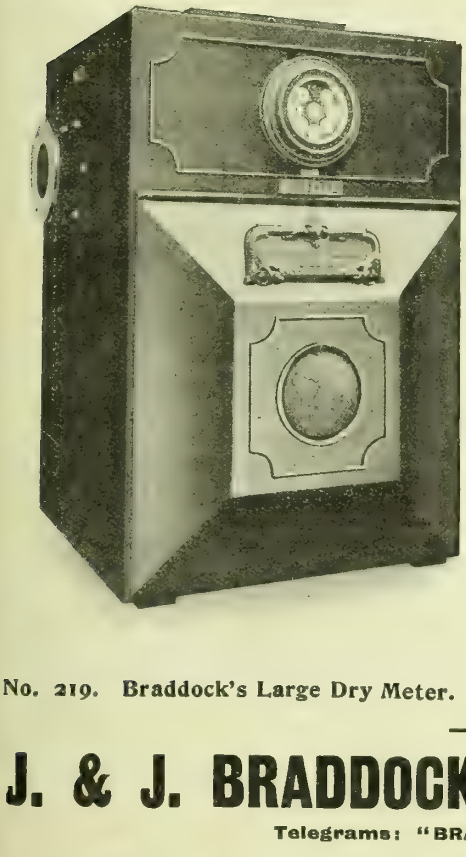

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GAS COMPANIES IN THE STOCK EXCHANGE.

As might be expected, business on the Stock Exchange continued to be on a very reduced scale last week; but at all events the House was open the full six days. Several markets showed some good points, and the general tone on the whole was decidedly favourable. Home Government issues were firmer. Not the War Loan only showed improvement, but Consols took a stronger position. Canadian Rails also made a good upward movement—harvest prospects giving indications of fair promise. A similar factor imparted firmness to Argentine Rails. Americans advanced, partly in view of the attitude of Washington in regard to the "Arabic" atrocity, and partly encouraged by the hope that the exchange difficulty will be satisfactorily solved. South Africans also participated in the general firmness; and in the Miscellaneous group, oil, copper, rubber, and warlike material and appliances were firm. Almost the only weak market was Home Rails, which were depressed by the coal strike. The phenomenal incident of London and North-Western stock being down below par attracted notice. Business in the Gas Market continued quite on the holiday scale. What bargains were marked were all in the issues of the premier Company, with the exception of a few—totalling less than a dozen—in all the rest. Prices recorded were practically unchanged from those recently obtained. In the Money Market, movements were variable, with alternations of firmness and ease.

Bargains done for cash during the week were as follows: On Monday, Continental Union 39½, 40, Gas Light ordinary 78½, 79, 79⅛, 79¼, ditto maximum 58, ditto debenture 62½, 63½, Imperial Continental 55, 55. On Tuesday, Gas Light ordinary 78¾, 78⅞, 79, 79⅛, 79¼, ditto maximum 58, 58⅝. On Wednesday, Gas Light ordinary 78¾, 79, 79¼, ditto maximum 58, 58¼, 58⅜, 58½, 59, Primitiva preference 3½. On Thursday, Brentford "B" 85, European 12½, 12¾, Gas Light ordinary 79, 79¼, South Metropolitan debenture 60½. On Friday, Aldershot 79, 79½, Gas Light ordinary 78¾, 79, 79¼, Liverpool 96½, Primitiva preference 3⅝, South Metropolitan debenture 61. On Saturday, Gas Light ordinary 78½, 79.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING AUG. 28.

Issue.	Share	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	..
374,000	"	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7½	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	..
50,000	10	Feb. 26	16	Bournemouth Gas and Water 10 p.c. . .	29—30	5 6 8	..
873,480	10	"	7	B 7 p.c. .	15—15½	4 10 4	..
95,000	10	"	6	Pref. 6 p.c.	13½—14	4 5 9	..
—	—	—	—	Deb. . .	..	—	..
380,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
330,000	"	"	11	Do. New . . .	204—209	5 5 3	85
50,000	"	"	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
206,250	"	June 11	4	Do. 4 p.c. Deb. .	91—93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 8 4	..
244,200	"	"	8	Do. A Ord. Stk. .	154—159	5 0 8	..
530,000	20	Mar. 26	12½	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	Do. 4½ p.c. Pref. .	4—6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb.Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	..
560,000	"	"	5⅓	Do. 3½ p.c. do. .	103—105	5 1 6	..
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	..
800 000	Stk.	"	4	Continental Union, Ltd.	76—79	5 1 3	39½—40
200 000	"	"	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	.	—	..
492,270	Stk.	—	6	Derby Con. Stk. . . .	123—125	4 16 0	..
55,000	"	—	4	Do. Deb. Stk. .	102—104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd. . . .	17½—18	5 11 1	12½—12¾
16,36[illegible],910	Stk.	Feb. 12	4/17/4	Gas Light and Coke 4 p.c. Ord. . .	98—102	4 15 6	78½—79¼*
2,600,000	"	"	3½	3½ p.c. max. .	76—79	4 8 7	58—59*
4,062,235	"	"	4	4 p.c. Con. Pref.	96—99	4 0 10	..
4,674,850	"	June 11	3	3 p.c. Con. Deb.	72½—74½	4 0 6	62½—63½
130,000	"	"	10	10 p.c. Bonds .	..	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16½—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c. . . .	..	—	..
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C . . .	151—154	5 2 4	..
65,780	"	"	6⅜†	Do. B	115—118	5 8 0	..
65,500	"	June 26	4	Do. 4 p.c. Deb. . .	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental .	150—160	5 12 6	55—56
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c. .	119—121	5 7 5	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. A	211—213	4 13 11	96½*
718,100	"	"	7	B	146—14	4 14 7	
306,083	"	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	—

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowe an Highe Prices Bargai
£			p.c.			£ s. d.	
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd. . .	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	98½—99½	4 10 6	
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	..
800,000	Stk.	May 14	8	Oriental, Ltd. . . .	117—122	6 11 2	..
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .	7¼—7¾	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B . .	128—131	4 19 8	..
100,000	50	"	12	Do. C . .	118—121	4 19 2	..
52,000	50	"	10	Do. D . .	..	—	..
249,980	5	April 29	8	Primitiva Ord. . . .	5½—6	6 18 4	..
499,960	5	June 26	5	" 5 p.c. Pref. .	4¾—5	5 0 0	3½—3
521,600	100	June 2	4	" 4 p.c. Deb. .	91—93	4 6 0	..
—	—	—	—	" " " 1911	..	—	..
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 8	..
209,984	"	"	10	Do. B	222—224	4 9 8	..
523,500	"	"	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African . . .	10½—11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	..
1,895,445	"	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	60½—61
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	..
60,000	"	"	5	Do. 5 p.c. Pref. .	110—112	4 9 8	..
—	—	—	—	Do. West Kent. .	..	—	..
137,058	"	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord. . .	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c. .	135—138	5 8 8	..
742,275	"	"	6†	B 3½ p.c. .	115—117	5 2 7	..
181,255	"	June 26	4	4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
80,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	"	"	6⅞	" B 3½ p.c.	129—134	5 2 7	..
108,075	"	"	5/17/3	" C 3½ p.c.	110—115	5 2 0	..
352,000	"	"	6⅛	Wimbledon 5 p.c. .	117—122	5 0 5	..
98,000	"	"	6⅜	Epsom 5 p.c. . . .	121—126	5 5 2	..
88,416	"	June 26	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

* Ex Div.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Exhauster Attendant. No. 6080.
Lid and Pipe Attendant. No. 6080.
Stoker. Halesowen Gas-Works.
Fitter. No. 6084.

Pupil Vacancy. No. 6082.

Partnerships (Offered and Required).

No. 6081.
No. 6083.

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EDITORIAL NOTES.

The Open Residuals Clause.

IN reviewing the Acts of Local Authorities since the editorial on the above subject was published last week, it has been observed that there has not been a uniform omission during the session of the residuals restrictive proviso, which limits the purchase rights of a gas undertaking to an amount equal to one-third of its own production. But the balance, taking company and local authority measures together, is in favour of the omission; and this should strengthen the hands of promoters in the coming session. The Lurgan District Council Act, it will be remarked from our second article on the Gas Acts of the session, has succeeded without the objectionable proviso in it. We see by the imprint on the Act that the Parliamentary Agents were Messrs. Lees and Co.; and they also piloted the Warwick Company's measure through, which (as was mentioned in an editorial a week since) likewise passed with the model residuals clause in it, but *minus* the restriction. The other Acts that went through without the limitation were, as notified last week, those of the Prescot and Ormskirk Companies, the Parliamentary Agents for which were respectively Messrs. Dyson and Co. and Messrs. Butterworth and Co. We have not yet had an opportunity of seeing all the Gas Provisional Orders; but it is observed that the restriction does not appear in the Heathfield and Waldron Order, for which the first-named firm of Parliamentary Agents acted. The proviso, however, does appear in the Plymouth (in respect of the Devonport Gas-Works), Skegness, and Port Glasgow Acts.

While the gas industry did not want the line of precedents extended for the imposition of the one-third restriction, to have had it deliberately omitted in so many cases this session is a distinct gain for that equality of liberty for gas undertakings with chemical manufacturers in dealing in residual products for which the industry has so persistently and so justly contended, and which the Committee specially deputed to investigate and adjudicate upon the matter held should be maintained. The gain is the result of submissions to the Lord Chairman by representatives of the promoters of the Bills. It will be remembered that, in most of the Bills as lodged for the present session of Parliament, the restricting provision (though in the Model Clause) was not inserted, as there is no intention on the part of the gas industry to relinquish its freedom in this respect without still struggling and protesting against the obvious injustice of making gas undertakings subjective in any way to the purchasers of their secondary products. Naturally, the exclusion of the proviso from the Bills attracted the attention of the Lord Chairman; and he raised the point in his observations on the measures. The matter, we learn on inquiry, was subsequently fully discussed before his Lordship—it being contended that the proviso in the Model Bill, which follows section 45 of the South Suburban Gas Company's Act of 1914, was contrary to the report of the Joint Committee; that the Joint Committee had considered the matter from the point of view of gas undertakings generally, while the South Suburban case was a single one decided by a single Select Committee; that this Company's undertaking was a very large one; and that it could not therefore be compared with the undertakings of the companies and local authorities promoting Bills from which it was asked the proviso should be excluded. On these and other grounds, it was submitted that it would be unreasonable to put the limitation on these companies and authorities. As a result of the discussion, his Lordship agreed to the omission of the one-third limitation, but required the general powers clauses in the Bills to be altered to follow the model residuals conditions in other respects. This alteration gives the gas industry all it asks for. With the model, *minus* the one-third restriction, it will be perfectly content.

In the case of Provisional Orders, it appears that at first the Board of Trade made them all conform to the model, including the restriction. But as previously remarked, the proviso does not appear in the Heathfield and Waldron Order; and investigation informs us that there was success in persuading the Board to delete the limitation when the Bill to confirm the Order was in Committee of the House of Commons. There was no doubt the Board of Trade were influenced in this course by Messrs. Lees and Co. being in the position to point to the excision of the proviso in the case of the Warwick, Prescot, and Ormskirk Bills. Whether it was omitted from Bills confirming other Board of Trade Provisional Orders, we are not yet in a position to say.

The varied experience in this matter during the session raises both hopes and fears. It is hoped that the objectionable and unfair restricting proviso will henceforth be generally omitted; but there is doubt as to whether or not the view the Lord Chairman takes is that there should only be omission in the case of what may be described as the smaller undertakings. However, in view of the precedents for full residuals liberty that have been instituted this session, and of the inestimable service that the gas industry is rendering to the country through its residual products and the extraction from the gas of toluene for high explosive purposes, the hope is entertained that the parliamentary authorities will henceforth see it is in the best of national and economic interests that free trading shall be maintained in the secondary products of gas manufacture.

A Universal Calorific Standard for Canada.

IT has been observed before that when Canada makes a new prescript regarding its gas supply, it does it thoroughly, after due inquiry, and not piecemeal. For some time past, consideration has been given, by the authorities concerned, to the question of the adoption of a calorific value standard to apply universally throughout the Dominion; and now an Order in Council has been issued which decrees that henceforth the standard of gas supply is to be a calorific value one, and it is to be 520 B.Th.U. (total heat test). Canada may pride itself upon the fact that, if it was not the first country to adopt a calorific value standard, it is the first to universally institute such a standard. The governing regulations are very explicit indeed; and for a copy of them, we are indebted to Mr. Ormond Higman, of Ottawa, the Chief Engineer of the Electrical Standards Laboratory of the Department of Inland Revenue.

The fixing of a standard of 520 B.Th.U. (total heat test) is interesting. This figure has not been selected by any haphazard means; but very careful consideration has been given to it. Considerable pressure was brought to bear on the department to adopt the largely applied American standard of 600 B.Th.U., rather than the British standard of approximately 500 B.Th.U., which is what the 540 B.Th.U. really mean with a 7½ per cent. allowance before penalties begin to obtain. However, the department properly resisted this pressure. In doing so, they have studied not only the interests of the gas undertakings, but of the gas consumers; for in a 600 B.Th.U. gas, there is not the degree of flexibility and good heating service that there is in one giving about 500 B.Th.U. The consumers lose much heat by the degree of aëration that the higher grade gas requires, and by the difficulty of obtaining an adequate admixture of air with a gas of such constitution. The cost of producing the higher grade gas is also necessarily higher than that of making the lower and more serviceable quality. The department, therefore, in adopting a standard of 520 B.Th.U., instead of one of 600 B.Th.U., have followed a real economic course. In deciding on a standard, too, to have application throughout the Dominion, a figure has been settled upon which investigations give assurance can be worked to under all the prevailing conditions of manufacture. We are not particularly enamoured of a uniform figure as a standard, especially in a country as here where the most available coal supplies vary so considerably in different localities in their gas-making properties. But no real objection can be raised to a standard to which it is possible for all undertakings to work—from the worst placed to the best placed for their raw materials.

Save in two other respects, the regulations follow closely the lines of our own parliamentary model. The first exception is that it is open to anybody, at any reasonable time, after depositing the necessary fee (amount not stated), to have a test made of the calorific value of the gas. In the event of the calorific value as determined by the test being found below the standard, the cost of the test is to be paid for by the undertaker; but if the result is at or above the standard, the charge is to be paid by the party whose inquisitiveness led to the special test being made. This prescription does not appeal to us as being a very useful one, where the ordinary testing authorities regularly perform their guardianship functions in this matter. However, the provision cannot do any harm; and there may, admittedly, be times when it will come in useful. The other difference from the British prescription refers to the penalties. There is a sliding-scale of penalty according to the number of meters that a defaulting undertaking has connected-up—that is to say, the penalty increases by graduated steps according to the number of meters, and therefore according to the number of the consumers who suffer from the default of the suppliers. For our own part, we prefer the British mode of having an advancing penalty according to the degree of default. But there is no provision for this in the Canadian regulations; so that there would be no greater penalty for a large than for a small lapse from the standard. We cannot see how penalties based on the number of meters could be applied effectively to the gas undertakings in this country, with connections ranging from a few hundreds up to (say) about 800,000 in the case of the Gas Light and Coke Company. Some of the undertakings, too, have more than one manufacturing station; and the gas being distributed from one station might be well above the standard, while that from the other was below. In such circumstances, the meters fixed would prove a very ineffective basis for the penalties. However, the main thing is that Canada deserves hearty congratulations over the progressive move it has made in relation to its gas supply.

The Coal Position, and Tar Washing of Gas.

It was an ample and interesting programme that was arranged for the meeting of the North British Association of Gas Managers last Friday. In addition to the address of the President (Mr. J. B. Scott, of Cowdenbeath), there were four papers, and, among other matters, opportunity was taken to do honour to Mr. G. R. Hislop, *doyen* of the gas profession of Scotland, who is venerated for all he has been, and all he is, not only by the section of the profession across the Border, but by members of the profession throughout the British Isles.

The address of the President was a frank and thoughtful production; in the main picturing the adverse conditions and effects produced by the war—an accumulation of both such as the industry has never before experienced during its long and progressive career. It has been accustomed to adversity as well as to prosperity, and has always successfully ploughed through the former to more open waters. But such adversity as has been experienced in the past has been (as we now view it, if we did not at the time of happening) light and colourless compared with the heavy, sombre difficulties of these times. Yet such is the vitality of the industry, and the grit of those at the helm, that it is sailing through the vastly troubled waters with merely an amount of injury which is now fully measurable, and which is being kept well in check.

Among the difficulties has been, and is, that of coal. The President is fully in agreement with the prohibition placed upon the free export of coal; and this he is convinced is of more importance to the home industry than is or will be the Price of Coal (Limitation) Act. So far we agree. But the Act is supplementary and essential to the prohibition, without licence, of the export of coal. Mr. Scott does not appear to think that the Act will be of any particular value in the lowering of the price of coal—in fact, he is of opinion that some undertakings may be worse off owing to its existence—his own for example. This is purely a matter of conjecture; and it does not take into account what might have been had the Act not become law. There are some gas undertakings with contracts made since April 1 at prices 5s., 6s., and 7s. above the pithead prices which ruled in their previous contracts. They can benefit if they choose; and managers who do so choose will not see eye to eye with Mr. Scott. There are other managers who have only entered into their contracts since the Act became law. They too have reaped advantage. Can the President inform us to what figure the price of coal would likely have risen, despite reduced export, had restraint not been imposed by the Act? Also with exports largely diminished, which would have paid the coalowners the better, to have put into the home markets a supply in excess of the demand, or to have refrained from any movement to supplement supply in order to command high prices and profits? The questions are merely put for consideration; we do not ask for, nor expect, an answer—it would, in fact, be useless to attempt to predict just what would have happened. Without the Act, the future would have been speculative; but there is nothing speculative about the position now. It is, under the current conditions, to the interest of the coalowners to give the country as much coal as it requires, and to get the best price possible within the limits of the law. The Act is not for to-day only; it is for every to-morrow, until the hyperbolical circumstances created by war do not intervene in our ordinary trading. The Act is for our common protection. It would never do to argue that because ninety-nine people out of a hundred may never have actual recourse to the common law of the land, that the common law is of no value to them. While of advantage in the case of the hundredth person, its very existence is a standing protection to all the others. The same with the Coal Prices (Limitation) Act; it will protect. The pre-existing menaces were too vivid to be hid from the observant; hence the *raison d'être* for the measure. But though the President indicates his opinion that there is nothing very much in the Act, he subsequently complains of the omission of non-statutory undertakings from the retrospective clause. We are with him there, so far as public services are concerned. But it is clear the Legislature had difficulty in arbitrating between various interests, and in drawing the line at a point that would be fair. So they drew it at local authorities, statutory companies, and household coal. It would be a somewhat difficult thing to define precisely what is a "public service," or, to use Mr. Scott's term, "public necessity."

Out of much else entering into the composition of the address, emerge as of special interest the President's references to the washing of gas by tar. By this process gas undertakings are doing something that they would possibly never have done had the war not made it imperative. Tar-washing of gas would have been scouted by many as liable to do grievous injury to the gas; but the President testifies that he has increased the light oil content to six times the original amount, without doing any serious injury to the gas. It is all a question of the proper temperature at which the washing is conducted as to whether any substantial injury is inflicted upon the gas or the tar. Mr. Scott agrees with the use of a tower scrubber for the purpose; that is becoming the general view. The only thing against which small works have to guard is that their ammonia extraction does not suffer, if their scrubbing plant has no margin in it to devote to tar-washing. The President is also of opinion that as yet all gas-works are not being adequately remunerated for the increased value of the tar. That is certain; and it is a matter that was dealt with in articles in the "Journal" for July 20. Here we must leave the address, as the papers supply other topics for notice.

Commercial Problems of Sulphate of Ammonia.

Long-established custom and convictions are as difficult to break through as the Dardanelles; but just as the joint fleets of Great Britain and her Allies, with the land forces, will succeed with their operations in the Near East, so old custom and convictions that still exist among some makers of sulphate of ammonia will in time be broken down, either through their own good sense or by the compulsion that the strength of new conditions will exert by producing disadvantage for those who still live in the commercial past. The Sulphate of Ammonia Association are carrying on a persistent campaign in this connection; and the day will dawn when every British producer of the commodity will thank the Association for their foresight and perseverance—a perseverance which led Mr. F. C. O. Speyer to read, on their behalf, a paper on the subject at the meeting of the North

British Association. The campaign must not be relinquished until the ranks of those who realize what is before British sulphate of ammonia, and have shaped their course accordingly, are lengthened to the fullest possible extreme.

What is it that the Sulphate of Ammonia Association are preaching and teaching so assiduously? It is that the conditions under which producers are working, and will have to work more strenuously in the future, have, with the progress of time—through enlarged production, and new invention, which has given rise to new competition—been altogether reformed, and in such drastic manner that commercial practices must be immediately remoulded. The new practices and policy, however, are not very readily being universally accepted. The singular thing about this scattered reluctance to accept is that the Association are not putting forward mere shadows for the purpose of inducing acceptance, but very material facts, which should appeal to the most obtuse intelligence. Sulphate of ammonia must not be looked upon and treated as though it enjoyed a real monopoly. It never has done so; and it is as certain as anything temporal can be that British sulphate of ammonia will meet with vast resistance in the markets in the future, and will have to be prepared for a constant tense struggle. Let us see. Is it not a material fact, and an ample full justification for the policy of the Association, that the world's production of nitrogen in the shape of fertilizers has been increased with vast strides of late years? Is it not a material fact that the increase has now no limits save the one that makes production profitless? Is it not a material fact that competition has been so rapidly enlarged that the new comers were in actual competition before most of the older producers of sulphate of ammonia were aware of it? While some of these old producers opened their eyes with surprise, others were sceptical of anything having happened that was more than a fanciful and an impracticable notion, which would vanish from the scene as promptly as it came on to it. The answers to all the questions must be in the affirmative. In addition to the world's production of sulphate of ammonia enlarging quickly from coal carbonization and by increased recovery from coke-ovens, in addition to the old competition of nitrate of soda, there were before the war actually in trading existence synthetic sulphate of ammonia, and cyanamide or Norwegian nitrate of lime; and production from these sources is going to increase enormously. What is the conclusion to be drawn from this? It is, as Mr. Speyer puts it, that, "after the war, competition in the world's nitrogen " market will be more severe than ever before, and that this " competition will inevitably have the effect of reducing the " level of price by many pounds per ton unless old markets " can be developed, and new outlets be found." By many pounds per ton! This alone should be a serious, thought-provoking, and mind-disturbing statement. Mr. Speyer cannot be accused of being an alarmist prophet. What he says is the practical and the only deduction that can be made by a man looking the cold facts straight in the face.

That, then, is the situation. Producers may try to fence with it, and may attempt to encourage the idea that the old methods will fit quite well the new conditions. To speak plainly, with the facts fully before us, those who do this are living in a Fool's Paradise; and they will find it an extremely uncomfortable place of habitation. Those who appreciate the situation have, like wise men, been considering how best to deal with it. The problems are commercial ones. Educational propaganda must continue. But the commercial problems must be dealt with; and upon these the Association have been concentrating attention. This is the part of Mr. Speyer's paper that has freshness; and it is the part over which the resisters—those who, disregarding the protection of their future in the sulphate of ammonia business, want to make the ultimate penny in the present from their production—will be disposed for controversy. We will only skim the proposals, and leave the argument as it stands in the paper, and for two reasons: First, that, with the facts of the situation well in mind, the proposals commend themselves; and, secondly, that those who are opposed to the policy of the Association in this matter have not disputed the fact as to an immense competition looming on the horizon (which competition will become very effective with the return of peace), and have not proposed any alternative schemes for meeting it. To consolidate and extend the consumption of the British production at home and abroad, and to preserve the markets to British production, the Association, in the first place, ask the makers to encourage the manure and agricultural merchants—the men in closest touch with the farmers—to stock sulphate of ammonia. This can only be done by the producers making it a rule to keep their price to the farmers 10s. per ton above the price to the merchants. Here we come up against the first difficulty. There are those who want to know why they should give up anything to the middleman. The whole point is whether the agricultural merchant is a factor in the situation—whether he is in a position to help to establish and consolidate the position of sulphate of ammonia among the users of fertilizers. The business relations of the one and the other do not give any room for doubt; and in creating permanence and a broadened market, the assistance of the merchant cannot fail to be invaluable. Mr. Speyer discusses the point as to whether the 10s. is really a sacrifice, inasmuch as already 3½ per cent. is allowed to the export merchant. He cannot see that it is; and all that is asked is that the 3½ per cent. shall be granted to the home merchant, and be made up to 10s. where it does not amount to this sum. Prudence and protection claim something from the producers, although we cannot see where there is anything that can be called a "sacrifice" in assuring a larger market than could possibly be obtained and retained by the efforts of the producers if externally unaided. The greater sacrifice would be in encouraging the merchants to favour a competing exotic fertilizer.

But the more important part of the commercial scheme is in the proposals of the Association for avoiding rapid price fluctuations, which are an abomination in the eyes of the agricultural merchants. These fluctuations are a decided drawback to them in laying in stocks; and if their good offices are to be obtained in developing and holding markets for sulphate, something must be done to give them greater security. Firmer prices can only be realized by producers refraining from spoiling each other's markets by competing and underselling, and by giving longer tenure to prices. The proposal is for prices to be fixed monthly, in given districts, by a local committee of producers, for 24½ per cent. and 25 per cent. ammonia. It is true that this plan means the supplanting of competition by combination; and this will be objectionable to those producers who are strong adherents to Free Trade principles. We have, however, to consider the demands of the situation—consider whether this is not a case where expediency can, to the general advantage, over-ride political maxim. This appears to us to be such a case; for the fixing of prices cuts both ways, and the competition from fertilizers produced other than as a result of the carbonization of coal will assoil from any serious breach of principles those who follow the Free Trade banner. The matter is open for discussion. The Association want it discussed. If the general line of the scheme meets with approval, then the Association propose to organize the producers into suitable territorial groups, and develop the plan.

There is one other point regarding the commercial position, and that is the quality of the commodity. This is a subject that we have freely and frequently discussed; and so will not touch upon it on this occasion, though Mr. Speyer does so in his paper. But, generally, the commercial position of sulphate of ammonia cannot be too much discussed until the seriousness of the position—not the immediate position, but the prospective one, and nobody can tell how soon this may be upon us—is universally realized by the producers of sulphate, and there is perfect unity in setting out to meet it.

Broadening the Knowledge and Skill of Fitters.

No apology is needed for frequently turning attention to this subject. Given cheap and good gas, and excellent appliances, the reputation and progress of the industry are largely in the hands of the fitters employed; seeing that the realization or the marring of the best efficiency of the indispensables the one to the other—the gas and the appliances—depends largely upon the degree of efficiency of the man who has to instal the latter. A neat paper on the subject of the training and education of gas-fitters was presented to the members of the North British Association last week by Mr. R. W. Cowie, of Dalkeith. He is optimistic on good grounds as to the future of the gas industry. There is a grand scope for expansion lying all round. Advancing civilization has only commenced to turn man from the barbarous sacrifice of raw coal for the single purpose of producing heat to the use of gaseous fuel. Every kitchen, every room, every factory, every gallon of water the temperature of which has to be raised, offers an opening for business in gaseous fuel. And we are not at the end-all yet of the progress in the economy and efficiency of our appliances. Thinks anyone that, with all the science and skill that are being applied to the construction of gas-fires and other heating apparatus, nothing farther will be achieved? We have faith in manufacturers, and look upon all the knowledge that has been accumulated by them as one of the gas industry's assets and guarantees for the future. All the aids to commercial progress that are being brought to bear within the gas-works, and within the ancillary factories of the manufacturers of gas appliances, must not be spoilt by gas undertakings neglecting their duty in seeing that the knowledge and skill of their fitters are equal to the demands. The smaller works are not so well placed as the larger ones for promoting educational work among fitters; but Mr. Cowie describes what has been done in Edinburgh as well as by himself independently in a much smaller sphere. It occurs to us that some arrangement ought not to be impossible between large undertakings and the surrounding small ones for co-operation in the technical study and practical work of fitters, so raising ability and efficiency all round. There is something in this for the consideration of the larger gas undertakings. The reputation of the industry for "good works" in its lines of business does not rest upon what one gas undertaking does, but on what they all do. The work of gas undertakings is reciprocal. The manufacturer is a substantial customer for industrial purposes of the large gas undertaking in the city or town; but the manufacturer and his family reside some miles out in a district supplied by a small company. It is to the interest of the large gas undertaking that the manufacturer should be pleased not only with the work performed by gas in his factory, but that his good opinion of gas as a servant should extend to his home. The remarks of Mr. Cowie on the subject of examinations so fits in with our own views that there is no necessity to comment on them here. But the principal object of his paper is to help the movement for increasing the fitness of the gas-fitter for the industry's work in the present, and to make him a live factor in that progress which is a certainty if our forces are properly marshalled and their efficiency placed upon, and maintained at, the highest possible level.

A Simple Pressure-Wave Inducer.

"Necessity is the mother of invention." A very simple method (with a twelve months' working record testifying to its efficacy) of promoting pressure waves in connection with the distance automatic lighting and extinguishing of public lamps, was described at the North British meeting by Mr. James J. Scott, of Lower Largo. Under his particular circumstances, the processes of producing the necessary pressure waves which first occur to an engineer were not available to him, or he could not readily apply them. Mr. Scott therefore devised a little steam-injector in connection with a main-pipe, with drip box and bye-pass (the latter to avoid the station governor, and its connections); and with this very modest arrangement, he accomplishes his purpose. On opening the steam-valve slightly, the action of the steam passing from the injector through a conical "horn" carries the gas at high velocity into the district main, gradually increasing the pressure, which, in turn, automatically closes the governor—thus preventing the gas passing back to the holder. That is all; and the arrangement is reported by Mr. Scott to be highly effective and controllable. The operation can take place with any pressure of steam from 5 lbs. per square inch upwards; by controlling the quantity of steam, any desired pressure can be realized; and the time required is under the full control of the operator. There is the point as to the effect of the steam other than for its destined purpose. The quantity needed is really negligible; and as one would anticipate having regard to temperature, the steam is condensed within a few yards of the point of ingress, and flows away to the nearest drip-box. Mr. Scott is so pleased with the working of his device that he sees for it a useful career in connection with both large and small works, and a range of service extending beyond that for which he designed it.

Official Testing and the Accuracy of Gas-Meters.

The testing of gas-meters is not one of the controversial subjects that engage the attention of gas engineers at their meetings, though the proper testing of meters is of the utmost importance to them. A matter of greater moment is that, when once tested and not found wanting in accuracy, the meters shall have a long and unblemished life; for, on the proper working of the aggregate of meters in a gas-supply area, there is a large financial responsibility, and much depends on them in relation to the aspect of the figure representing unaccounted-for gas. But in respect of the actual work of testing, the guardian Legislature has largely divorced the interest of the gas man from it, by, as is right, placing the work in the hands of independent bodies. However, it is of extreme interest to hear, as the members of the North British Association heard, at their meeting last week, of the experiences of an official, such as Mr. William Gordon, of Edinburgh, who is daily engaged in this work. We are rather inclined to think that, if such officials and gas engineers got into closer contact (there could be no question of interfering with the liberty of the former), something more than has hitherto been done could be accomplished towards amending the antiquated legislation applying to the testing of meters, as well as in devising and perfecting new apparatus for meter-testing under the fresh conditions brought into being by high-pressure gas distribution.

It is useful to have Mr. Gordon's independent testimony as to the perfection that obtains in these days in connection with gas-meters. When he tells us that during the past three years, he has had to reject for inaccuracy only 0·73 per cent. of dry meters and 0·24 per cent. of wet meters, the information can be accounted good. Still further evidence of perfection over a range of conditions which may fairly well come within the description of normal variations is given in the references in the paper to a test of a 5-light meter (taken indiscriminately from stock) at pressures ranging from 0·5 inch to 4 inches—the gas passing being maintained uniform at 30 cubic feet per hour. The result was that at all points between the two limits of pressure named, the meter stood constant at 1·01 per cent. fast. A further test was made between 0·5 inch up to 3 inches pressure with the consumption increasing by steps between 30 cubic feet at 0·5 inch pressure and 75 cubic feet at 3 inches pressure. After the pressure of 0·5 inch was passed, there was complete accuracy with the higher consumption at each successive stage of testing. These tests go to show that the gas-meter is now an instrument possessing a high degree of exactitude; and in view of the ancient condition as to pressure in the Sale of Gas Act, such testimony as this shows how well the meter manufacturers have, without any official compulsion, kept abreast of the need for meters to register correctly at the different pressures now more or less normal, and at the different consumptions represented by that of a single bijou gas-burner up to a fairly heavy simultaneous lighting, heating, and cooking consumption.

On the vexed question as to the special testing of indices, Mr. Gordon appears, contrary to some of his colleagues, to think that this would be a work of supererogation, and that the expense would not be justified. It would be folly to unnecessarily increase work and expense; but there have been examiners who—perhaps with other makes of meters—have not found all indices possess the right to freedom from censure. In his references to high-pressure meter testing, Mr. Gordon does not mention the statutory powers obtained last year by the London County Council and the City Corporation. It is clear that he is not satisfied that there is yet the right apparatus in existence for accurately testing high-pressure gas-meters; and he is persuaded that the devising of such apparatus is work that requires very critical investigation. In connection with high-pressure distribution generally, he suggests the advisability of gas engineers agreeing upon a maximum pressure, as he thinks this would enable the manufacturers of the apparatus for utilizing the gas to standardize their wares. In offering this suggestion, Mr. Gordon appears to be a little out of touch with the practice demanded by varied need. In single districts—especially industrial ones—there is a great difference between the high pressures required for the various operations. The maximum pressure requisite in Birmingham, with its diverse industrial operations, may not be the pressure wanted in an area where lighting and perhaps one or two industrial purposes sum up requirements. According to the distance the gas has to travel and the draught upon the mains, the maximum pressure at the works must also vary. But uniformity is obtained by governing-down to the necessary pressure at each point of consumption. Under the varying conditions which define the most appropriate local maximum pressure, it would be impossible to fix upon a uniform figure for all high-pressure systems.

Responsibility and Reputation.

Sixty-six years of gas management is a good innings. Few have ever claimed it; and probably comparatively few will ever be able to. There are, however, several instances on record of the service of a gas official to one undertaking for half a century. Mr. George R. Hislop is an example; and on the completion of his fifty years' service at Paisley, and sixty-six of gas management, the members of the North British Association desired to mark regard and friendship for him, and appreciation of the work he has rendered the industry. This they did at their meeting last Friday, when the President (Mr. J. B. Scott, of Cowdenbeath), in phrase and thought equally eloquent, asked his acceptance of an illuminated address. It was a graceful act, and the recipient, as all in the industry knows, is well worthy of it. There are two sentences in the reply made by Mr. Hislop, which ought to be marked well. "The importance of the industry carries with it a corresponding responsibility on those associated with it." That is one sentence. The importance of the industry grows, and so does responsibility. But this is not recognized by all in administrative and executive positions. Mr. Hislop also urged the men of the profession to do and act so that the world might know that in the industry "there were to be found men of skill, capacity, and administrative ability, who were altogether well qualified to discharge the duties that devolved upon them."

Gas Washing by Tar or Creosote Oil.

In another part of the "JOURNAL," an interesting and valuable article appears, from a "Coke-Oven Expert." In this, he gives us his views from large personal experience on the subject of the extraction of benzene, toluene, &c., from coal gas, and places these experiences at the service of the gas industry in connection with the practices that are at the present time being pursued by it. The portion of the article that will perhaps arrest in greatest measure the attention of gas engineers, who are doing a good part in supplying the country with toluene by the treatment of their gas is towards the end, where are discussed the relative merits of washing gas by tar and by oil. In coke-oven practice, a light creosote oil is employed for the purpose in view; and the coke-oven practitioners are strongly averse to using tar, or any washing medium containing tarry matter, for relieving the gas of the needful constituents. The reason that tar-washing has been so largely adopted by gas-works is that, while tar may not have such a high absorbent efficiency as creosote oil, the country's requirements demanded quick work and results. Scrubbers and tar, with little expense attaching to the introduction of a fresh process, were available on most works; and enriching the tar by useful light oils, and particularly toluol, had prompt and efficacious results. In deciding upon adoption, consideration was not given so much to comparative efficiency of processes as to the point of expeditiously and economically lightening the pressure upon the country for toluol supplies.

Some Considerations.

Our contributor submits an interesting elucidation of an observed action that takes place in the washing of gas as practised at coke-ovens and in the process Dr. Davidson proposed. It is this, that a stream of gas passing through oil already saturated with recovered products brings about an evaporation or vaporization of the products similar in effect to fractional distillation. The gas takes the place of heat, and the oil—having the greater affinity for toluene, xylene, &c.—acts as the dephlegmator; so that the lower boiling-point products pass forward, and the higher ones are retained. An experiment with a rotary washer, and without adding benzol to the wash-oil, showed our contributor that, by correct limitation of flow, most of the toluene, &c., can be retained in the oil while most of the benzene is carried forward in the gas. The fall in calorific value did not exceed 3 per cent. of the net value. Another point made is that the lower efficiency of tar-washing compared with creosote oil necessitates a corresponding increase in scrubbing area; or, to put the matter in another way any works using an apparatus to scrub the gas with tar could, by using creosote oil, realize three times the output of toluene in the same apparatus. There is matter here for discussion by the experts. At the moment, it has to be repeated that the choice of system by gas-works has been largely governed by expediency.

Lighting of Factories—First Report.

The first report of the Departmental Committee on Lighting in Factories and Workshops has been issued; and it is an important document, with a medley of valuable detail in the appendices which requires some one with the time and ability to go through it carefully and critically for the purpose of separating the wheat from the chaff. The report itself is somewhat diffuse; but the recommendations are excellent up to a point. Some of them, however—such as those proposing minimum foot-candle illumination—would require, if penalty legislation ensues, an illumination expert on the staff of every factory to see that the illumination does not fall below prescription. They would also add greatly to the work of Inspectors of Factories and Workshops, and would mean an increase in the staff of Inspectors, if, in addition to current work, artificial illumination tests had to be carried out, and after civil service hours when darkness reigned. The Committee have not yet completed their work; but we may already compliment them on the thorough and persistent manner in which they have been going about it, and upon the large range of investigation undertaken to get at a basis of procedure, for this is entirely new and difficult work—difficult owing to the enormous dissimilarity of work.

Importance of Deficiencies.

We are all agreed, and have long been agreed, that proper illumination in factories and workshops is important from the points of view of preventing accidents, of contributing to the preservation of health and eyesight, and of promoting output and quality—in short, it is an economic question with many sides, and great value attaching to each. The Committee appear to have kept a respectful distance from giving any public expression of opinion as to the relative ill-effects of different light sources upon the eyes, so as to guide the factory owner as to which is the least harmful in the matter of intrinsic brilliancy. As to safety, too, there does not seem to be any guidance as to whether in factory lighting, especially where a large number of female operatives are employed, it is preferable to have a system of lighting which, owing to a single mishap, may cause a collapse of lighting throughout a building, or whether it is better to have a system of which only individual points (if ever) fail, and then can be promptly restored. However, there are good recommendations in the report, though we should have been glad if the Committee had been able to invent some simple means by which the factory owner could ascertain whether his lighting was quantitatively up to standard. We cannot conjure up a picture of the factory owner dabbling in measurements of parts of a foot-candle on the horizontal plane at floor or working level. Still, he may screw-up sufficient interest to study the full description of technical terms given in the report. The "Memorandum" epitomizing the report and recommendations is published elsewhere, together with (*in extenso*) the recommendations and conclusion. We may have an opportunity of further discussing the report.

Radiant Heat Distribution.

A fresh subject has been raised for discussion and experiment by the article describing the new Richmond fire, and the leaderette thereon, which appeared in last week's issue. It is a good thing to keep interest alive in a direction in which the potentialities are so great as they are in domestic heating. Among the communications on the question is one (which is for publication, and so appears in our "Correspondence" columns) from that excellent and competent critic, Mr. Jas. W. Wilson. He evidently sees little benefit in the new design, the primary object of which is to increase the field of radiant heat distribution, and the secondary object to gain additional appreciation and thus popularity. Mr. Wilson apparently cannot see that the new construction does extend the field of radiant heat distribution. The straight front, he writes, with the radiant heat travelling in straight lines "*in all directions* [italics are desired by our correspondent], not merely at right angles to the front but sideways, would effectively warm anyone sitting with a chair on any part of the hearth rug." No one has said the contrary. But instead of writing thus vaguely, we should like Mr. Wilson to say positively if his opinion is that the radiations proceeding "side-ways" from the straight-fronted fire are co-equal in direction and aggregate intensity with those from a fire with semi-circular front. To contend that they are would suggest that the sideway radiations from the flat-faced fire had made a departure from the "straight" path, and had assumed a certain obliquity, which is against the law they ought to obey. We quite agree that a straight-faced fire will warm anyone sitting with a chair on any part of a hearth rug, providing the area of the hearth rug is not an abnormal one. No sitter, Mr. Wilson also says, would wish to be behind the line of effective radiation. Certainly not; and the semi-circular fire carries the effective line further back.

Other Directional Idiosyncrasies.

The next point submitted by our correspondent is that "the straight front has not been condemned, because there is too much heat in front." The use of the word "condemned" is rather strong. No one has "condemned" the straight-faced fire; what has been done is to suggest a larger and more effective distribution of its radiations by a new line of fuel placement. Following upon the words quoted above, Mr. Wilson remarks: "So we assume that the semi-circular front would have to give equally as much heat from the front to be effective. To make the sides effective, an increased amount of heat would have to be provided, which means bigger gas-bills." The argument is a plausible one; but has Mr. Wilson himself "overlooked" what we had not "overlooked" last week, that radiations travel in straight lines "in all directions" within the limits of the confinement of the incandescent material. Radiations will travel in "straight" lines right ahead from a semi-circular front just as from a flat-faced front. All that the new line of fuel disposition does is to increase the scope of travel of the radiations. A further objection by our correspondent is that "a view from the side would only take in half the heat area, but with a straight fire the whole is visible." The latter statement depends on the position of the person viewing the fire. This point we have tried from all angles; and there are positions at the two extreme ends of the large family semi-circle round a fire on the cold winter's night, where a half view will be more comfortable and congenial than no view at all. But that is a comparatively small matter. The point of most importance raised in Mr. Wilson's letter is that it is not possible to protect the semi-circular front from side draughts as one can a straight front. All fires are not exposed to side draughts. The point has, we know, been well in the mind of the firm in designing the fire; and it has been placed under long test. Mr. Wilson will admit that the proof of every pudding is in the eating; and the Richmond Company, we have no doubt, are quite prepared to abide by the verdict of practical experience. Nor have straight-faced fires been ejected from their productions. The semi-circular form enlarges the field of choice; and trials have satisfied the makers that it has advantages, which may be taken as "compensations" for any losses sustained, given a normal room, and not one with draughts cutting in the backs and legs of those sitting sideways to the front of a fire.

Welsh Coal Settlement.

The trouble in the South Wales coal-field has come to an end; and we all breathe freely again. No one intimately concerned in the dispute has cause to be proud of his part, and especially the many thousands of miners who compelled submission (however just their case) by the force of numbers and a cessation of work in the midst of the most critical times in our national history. Opportunists never had such favourable occasion, however much dishonour marked its use. What simply occurred to produce a settlement is, as all the world now knows, that the coalowners consented to a supplementary agreement bringing the enginemen, the pumpmen, mechanical staff, stokers, and banksmen who perform work on the afternoon and night shifts, within the operation of the "bonus turn"—the five afternoon or night shifts in a week which are reckoned as six—and making the award as to wages retrospective to Aug. 20. Regarding the general subject of the suspension of the Mines Eight Hours Act in order to increase output, it has been decided, at a Home Office conference, not to disturb existing arrangements, but to continue the efforts to reduce absenteeism, which, combined with the limitation of exports, ought to prove sufficient. Should this not be effectual, then the question of the suspension of the Act will be revived for further consideration.

Differences of Opinion.

Discussions of interest to ratepayers, as such, and gas consumers took place at the meetings of the Councils of Wigan and Stockport last week, reports of which will be found in the news columns of this issue. The topic is, of course, anything but a new one; but present circumstances perhaps lend added force to some of the arguments. In Wigan, as in other places, it is necessary to raise the price of gas, to meet abnormal costs; and here the discussion had its rise in an endeavour on the part of certain members to show that the proposal of the Gas Committee was not sufficiently drastic to meet the requirements of the case. The point about the matter, however, on which the consumers will most keenly fix their attention is to be found in a declaration on behalf of the Committee that, though in the past they have given money to the relief of the rates, as now constituted, they have no intention of giving any more. Had times been normal, their intention had been to reduce the price of gas according to the profits made, so that the small consumers should have the benefit. Thus the proposal to increase the price was made along with the promise that, whenever the Committee found they were making a profit, they would give it back to the consumer. This is good news for those who use gas; and seeing that the Committee have doubtless no power to bind their successors in a matter of policy of this kind, the consumers will certainly hope the Committee may remain "as now constituted" long enough to carry their promise into effect. The discussion at Stockport arose out of the presentation of the Borough Treasurer's annual statement of accounts; and many of the points raised were in connection with matters which had been introduced at an earlier meeting, when the report of the Gas Engineer for the past financial year was submitted. On that occasion one member had argued that it was an injustice to the consumers of gas "that they should be saddled with such a continual increase of borrowed money;" and the reply to this of the Chairman of the Finance Committee is that it is wrong to assume that the gas consumer finds the money for the gas-works. He maintains that the ratepayer finds it; and so the difference of opinion must remain.

The Restraining Influence of Nitrogen.

There has often been reference to the point that the larger the quantity of air a gas requires to realize perfect combustion, the greater the volume of products of combustion, through the increased quantity of incombustible nitrogen which travels in and away acting as a vehicle for heat which could be utilized to advantage in practical work. In an article in the "Times Engineering Supplement," on the "Uses of Intense Heat," it is pointed out that nitrogen is partly responsible for the fact that combustion furnaces cannot produce such high temperatures as the chemical and the electrical furnaces. It has a restraining influence on the flame, and prevents an excess of oxygen from reaching the combustible material. The writer goes on to explain how, by simple mechanical means, nitrogen can be driven from association with the oxygen of the air. A drum is fitted with fixed vanes on its inside circumference; the outside shell being perforated. Air is forced through this while it is revolving at a high-speed. The heavier constituent of the air is driven outwards by centrifugal force; and, as the air for combustion purposes is drawn from the centre of the drum, a greater quantity of oxygen passes to the furnace than would otherwise be the case. It is added that in a factory where an adaptation of this idea was tried commercially, it was found that the same amount of steam could be raised as before with a saving of 27 per cent. of the coal bill. Is there not a suggestion here for some of our makers of gas appliances in which high temperatures, increased economy, and working efficiency, are desired?

Photographic Records of Gas-Meter Readings.—Last Tuesday the "Daily Telegraph" published a message from their New York Correspondent to the effect that gas-meters in New York will hereafter be read by photograph. Meter-readers employed by the Consolidated Gas Company will be equipped with small cameras, which fit over the indicator on the meter. By pressing a button light is thrown on the dial and exposure made showing the amount of gas consumed since the last photograph. These photos are to be kept on file by the Company for the confutation of people who object to the size of their bills. Alluding to this proposal, the "Manchester Guardian" remarks: There is something very characteristic and most impressive about the profound American distrust of the five wits with which Nature has moderately endowed us. Wherever any one of them, or their accumulated result, can be replaced or supported by machinery, sooner or later the community on the other side of the Atlantic will supply the machinery.

DEATH OF MR. ADAM MACPHERSON.

A well-known member of the gas profession in Scotland has passed away, to the keen regret of a very wide circle of friends, in the person of Mr. Adam MacPherson, who died last Wednesday in Edinburgh. The sad event was the object of sympathetic reference by the President (Mr. J. B. Scott) at Friday's meeting of the North British Association of Gas Managers, of which the deceased had been twice President, and of which he was elected an honorary member in 1904.

Mr. MacPherson was born in the city of St. Andrews; and on the completion of his education, he was articled to Mr. Jesse Hall, at that time Manager of the gas-works in the town. There he had a practical training, which gave added value to the thorough scientific training he enjoyed at the University of St. Andrews. At the end of five years, Mr. MacPherson secured the position of Manager to the Stranraer Gas Company; and this he retained for three years, during which time he gave complete satisfaction to the Board. He then, however, left to take up what proved to be the principal work of his life at Kirkcaldy—being selected for the position of Gas Engineer and Manager there.

Mr. MacPherson was, as a matter of fact, in the service of the Kirkcaldy Gas Company as Engineer and Manager for the long period of 34½ years; having been appointed in 1869, and retiring in 1903, owing to ill-health. Subsequently, he was appointed a Director of the Company; and in 1910, after the death of Mr. Davidson [who up to that time occupied the chair], he was made Chairman. During his engineership of the Company, Mr. MacPherson almost entirely re-constructed the gas-works—bringing the plant up to date, and carrying out various large extensions necessitated by the increasing demand for gas. He was, it is said, one of the first Scotch gas engineers to adapt the regenerative system to retort-settings. He, of course, took an active part in the proceedings which led up to the transfer of the undertaking to the town.

He read various papers before the North British Association; and when, on two occasions, there were competitions for the best essays on certain subjects, Mr. MacPherson was each time awarded the prize. In addition to his work at Kirkcaldy, he was also engaged a good deal as a Consulting Engineer to other gas undertakings. Thus he led a busy life, of great usefulness to the industry with which he was connected.

OBITUARY.

Mr. John G. Lyon, head of Stainsby and Lyon, Limited, of the Aire Tar-Works, Knottingley, died at Pontefract last Friday week, at the age of 73.

The death is announced, as having taken place in the later weeks of last month, of Mr. Arthur W. Sharples (aged 47), of Oswaldtwistle, Lancs., the Secretary of Messrs. W. Metcalf, with which firm he had been associated for many years.

The "Journal für Gasbeleuchtung" of the 21st ult. gave particulars of the life-work of Herr Max Hempel, who died on June 10, within a few days of his 66th birthday. Born in Silesia, Herr Hempel spent a year in a London engineering works, which he left to serve in the Franco-Prussian war of 1870-71. He was then for ten years with the firm of Oechelhaeuser. In 1880-81, he was engaged on the construction of the No. III. gas-works at Breslau; and on their completion, he was appointed Works Manager—a position he held for six years. In 1886, he joined Herr Joseph Goetz in founding a constructional engineering works, of which in 1891 he became sole proprietor. This works, trading as the firm of "M. Hempel," of Westend, Berlin, has carried out in the past twenty-five years a great deal of constructional iron work on gas and water works in Germany.

PERSONAL.

The Leeds Corporation Gas Committee have appointed Mr. C. P. Tooley, Superintendent of the carburetted water-gas plant at the Meadow Lane works, to the vacant position of Assistant Manager at the New Wortley works.

Second-Lieutenant W. C. Nesbit, of the 6th Royal Dublin Fusiliers, reported from the Dardanelles as wounded and missing, was Chief Cashier of the Alliance and Dublin Consumers' Gas Company, and obtained his commission in December last.

Captain W. C. Church, 4th Battalion Essex Regiment (T.F.), was, we regret to learn, wounded during operations in the Dardanelles on the 21st ult. The injured officer, who was educated at Hurstpierpoint and Felsted, is the son of Mr. Worthington Church.

Mr. W. J. Liberty (Inspector of Public Lighting of the City of London), the Chief Petty Officer, R.N.A.S., H.M.S. "President," Foreign Service Section, Caterham, has been promoted to the Admiralty Board of Inventions and Research (Lord Fisher's new department).

We understand that the question of the appointment of a successor to Mr. W. D. Child as Engineer of the Romford Gas Company has not yet been decided. The Directors have, however, appointed Mr. C. W. Boyns to be Manager of the Company, in addition to his duties as Secretary.

Mr. John W. Lee, the President of the Yorkshire Junior Gas Association, late of the Sheffield United Gaslight Company, and for the past four years Chief Chemist to the Grassmoor Company, of Chesterfield, has been appointed Manager of their coke-ovens and bye-product plant. Mr. Lee is lecturer in "Gas Engineering" at the Sheffield University.

Last Thursday week the golden wedding was celebrated of Mr. and Mrs. Samuel Shepherd, of Springfield House, Guiseley. Mr. Shepherd has for long been connected with the Yeadon and Guiseley Gas Company and the Guiseley Water-Works Company; and, among the presents received, was a combined silver fruit dish and flower vase from the Directors of the former concern, and a silver flower vase from the latter Company.

After considering forty applications for the position of Gas Manager, the Gas Sub-Committee of the Biddulph Urban District Council reduced the number to two; and these candidates were interviewed by the full Gas Committee. As a result, they recommended the appointment of Mr. G. Hood, at a remuneration of 35s. per week, with house, rates, fire, and light; and this the Council have adopted. Mr. Hood is at present fitter and assistant at the works.

Referring to the late Mr. William Blakey, Chief Accountant to the Gas Light and Coke Company, whose death was recorded in the "Journal" a fortnight ago, the "Co-Partners' Magazine" remarks that he laboured wholeheartedly at the many details of the co-partnership scheme before its initiation, and was always interested in its operation. "His memorial is that of a most competent and painstaking officer and a very courteous and helpful friend of all those, and they were many, who sought his aid."

In the course of a letter to Mr. J. F. Braidwood, thanking the officers of the South Metropolitan Gas Company for their address and handsome presentation of silver on his retirement from the Chief Engineership, Mr. W. Doig Gibb asks that there may be conveyed to them his warm thanks for all their goodness—in thought, and word, and deed. The gifts, he says, will ever stand as a record of the good feeling between himself and the staff of the Company. "When I came among you," concludes Mr. Doig Gibb, "my declared policy was to do to others as I would that others do to me. However imperfectly I carried out this doctrine in my actual life, I still hope that, notwithstanding my all-too-premature breakdown, the seed which has been sown, and which has germinated, may continue to grow and grow. And, in these strenuous times, when the future of our nation is the greatest consideration with every thinking man, such a doctrine loyally lived up to will result in many a South Metropolitan official and workman being able to say at the end that he has done 'his bit'—he has left two blades of grass growing where only one grew before."

EXAMINATION PRIZE WINNERS.

From Mr. Arthur L. Griffith, the Secretary of the Society of British Gas Industries, we learn that the following are the winners of the prizes given by the Society in the City and Guilds of London Institute's recent examinations in "Gas Engineering" and "Gas Supply" (Honours Grade):

"Gas Engineering."

First Prize, Final Examination, £3 3s.	Leonard Howard Thomas, of 9, Chattaway Street, Nechells, Birmingham. Examined at the Birmingham Municipal Technical School.
Second Prize, Final Examination, £2 2s.	Wilfrid Baker Claridge, of the Gas-Works, Harpenden, Herts. Examined at the Regent Street Polytechnic, W.

"Gas Supply."

First Prize, Final Examination, £3 3s.	John Tattersall Haynes, of 72, Athol Street, Liverpool. Examined at the Liverpool Central Municipal Technical School.
Second Prize, Final Examination, equal. £1 1s. each.	Albert Harry Manning, of 32, Tooker Road, Rotherham. Examined at the Manchester Municipal School of Technology. Leonard Howard Thomas, of 9, Chattaway Street, Nechells, Birmingham. Examined at the Birmingham Municipal Technical School.

Gas Light and Coke Company's Success at San Francisco.—The preliminary list of awards at the Panama-Pacific Exposition, San Francisco, which has been announced, shows that the Products Works of the Gas Light and Coke Company have added to their numerous previous successes by securing the Grand Prix. The Company's excellently arranged exhibit includes the principal products obtained in the carbonization of coal for gas manufacture, and many of their characteristic derivatives. These products are, of course, treated at the Company's works at Beckton, which are the largest of their kind in the world. The display is divided into three sections of products—tar, ammonia, and cyanogen; and some typical coal-tar colours are shown in dilute solution.

GAS ACTS FOR 1915.

[Second Article.]

In last week's issue, the essential changes made during this parliamentary session in the gas measures promoted by statutory gas companies were noted; and to-day the points of variation between the gas clauses of the Bills and Acts of local authorities are dealt with. The Bills in this group were reviewed on Jan. 12 (p. 74), and attention will only be called now to the differences developed during the progress through Parliament.

The Chelmsford Corporation have secured the powers, in pursuance of the purchase clause in the Gas Company's Act of 1914, to enable them to acquire the undertaking of the Company. There is comparatively little change from the Bill as introduced. We see among the conditions applying to the payment of the purchase money that, in the event of the Treasury refusing their consent to the borrowing by the Company of the purchase money, the Company are not to be entitled to require the Corporation to pay the money until one month after such consent is given, or the necessity for such consent ceases, whichever is the earlier. A proviso appears to the effect that, if the Corporation do not pay the purchase money on the date of the consent, they are to pay the Company interest on it at the rate of 10 per cent. per annum from the date of consent to payment. The limits of supply are specifically defined; and it is observed that it has now been enacted that if, after the expiration of nine years from the passing of the Act, the Corporation have not laid mains for the supply of gas within any parish within the limits of supply, the Act shall not be deemed to prevent any company, person, or local authority obtaining the necessary statutory power from supplying gas to any of the parishes. In Chelmsford, and the parishes of Springfield, Broomfield, Great Baddow, and Widford, the price of gas is not to exceed 3s. 9d. per 1000 cubic feet; and in other parts of the area, the price is not to exceed by more than 9d. the price for the time being charged in Chelmsford. The people of the four parishes named above are resolved that they shall be on the same terms as those in the borough. They have caused the insertion of a provision to the effect that the price charged to the ordinary consumers in these parishes is not at any time to exceed the price charged to persons who burn gas through ordinary meters in the borough. In protective clauses in favour of the Rural District Council of Chelmsford, provision is made where pipes are hereafter laid or relaid for them being placed, wherever practicable, so that the top of the pipe is not less than 2 feet below the surface of the roadway. This, of course, does not apply to pipes laid under footpaths or greensward. The financial clauses have undergone amendment. The provision stands conferring such power as is necessary for providing the money for the purchase of the concern, for compensation, and for the expenses attendant upon the winding-up of the Company. For other purposes, £60,000 was asked for in the Bill; and the repayment period desired for the purchase money and loans raised was 35 years. This period has been allowed for the purchase money. What has happened in regard to the £60,000 is that power has been given to raise £36,000 for the erection, alteration, and improvement of the gas-works; the repayment period being forty years. A sum of £13,200 has been granted for new mains and the extension and improvement of mains; the repayment period being thirty years. An amount of £10,800 has been granted for new services, meters, stoves, and fittings; the repayment period for this being fifteen years. As already intimated, the Corporation are debarred from borrowing money (other than the money required for defraying the costs, charges, and expenses of the Act, and of opposing the Bill for the Act of 1914) during the continuance of the war and twelve months thereafter, unless the consent of the Treasury has been previously obtained. There are no other changes to record. [*Parliamentary Agents: Messrs. Hargreaves and Crowthers.*]

In the section of their Act asking for an extension of the limits of gas supply to Emley, Flockton, and Whitley Upper, the Dewsbury Corporation have had it enacted that all mains, pipes, and works laid down or executed by the Corporation before the passing of the Act for the purpose of supplying the areas named shall, for all purposes (including the borrowing of money), be deemed to have been laid down and executed under the powers of this Act. Regarding the price of gas, as from the expiration of any agreement made before the passing of the Act between the Corporation and the Council of any of the districts named, or as from the expiration of a period of ten years from June 30, 1915 (whichever shall be the earlier), the prices charged in that district are not to exceed the prices charged under similar circumstances for a corresponding supply in the borough by more than 8d. per 1000 cubic feet in Emley, 6d. in Flockton, and 4d. in Whitley Upper. In the Bill, the Corporation, in proposing the cancellation of the illuminating power standard, asked for a calorific value standard of 540 B.Th.U. on the model clause lines. The 540 has been altered to the very common prescription this session of 500 B.Th.U., without a margin. The Corporation are given the power to purchase crude or partially purified gas. A clause provides that section 50 [Application of Gas Revenue] of the Act of 1873 shall be read and have effect as if the district fund and general district rate were therein mentioned, instead of the borough fund and the borough rates leviable by the Corporation; and further that any deficiency in the revenue of the Corporation on account of the gas undertaking which is not made good out of their contingency or depreciation fund shall be made good out of the district fund,

> Provided that the total amount payable by a railway company in respect of the borough rate, and of the general district rate shall be the same as if this section had not been enacted, and as if any sum which the Corporation shall, in pursuance of this section, carry to the district fund had been carried to the borough fund, and applied in the manner authorized by the said section 50.

There are no other changes to record. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Doncaster Corporation have secured the gas-works lands powers which they sought; and a piece of land is scheduled for manufacturing purposes. The proposed extension of the limits of supply has been endorsed. The model calorific value standard displants the illuminating power one. Authorization is conferred to purchase gas in bulk in a crude or partially purified state. For gas-works purposes, the Corporation asked in the Bill for the right to borrow £65,000, with forty years as the period of repayment. The outcome of this request is that a sum of £53,000 has been allowed (with thirty years for repayment) for the erection of gas-works and the general purposes of the undertaking, other than meters; and for meters £10,000, with a ten years' repayment period. As in most other Acts, it is provided that nothing in the Act shall exempt the Corporation or the gas undertaking from the provisions of General Acts relating to gas supply which may be passed in this or any future session of Parliament. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

In the Lincoln Corporation Act, the parish of Bracebridge Heath appears to have been removed from the scheme for the extension of the area of supply, but North Hykeham and Waddington remain. The other gas clauses are of normal character. The Great Northern Railway Company and the Great Eastern Railway Company and the Joint Committee of these Companies have secured protection. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The terms (stated when noticing the Bill on Jan. 12 last) on which the Lurgan Gas Light and Chemical Company are parting with their works to the District Council are confirmed in the Act promoted by the latter. We see, in the clause providing for the continuance and maintenance of the gas-works, that the residuals powers are as the model, but without any restriction—a proper restoration of liberty which was the subject of comment in our editorial columns last week when dealing with Statutory Gas Companies Acts. Protective clauses are accorded the Down County Council. Following the clause defining the limits of supply, provision is made for the sale of the plant in outside districts if the local authorities desire to purchase. The maximum price of gas has been placed at 4s. 6d. instead of 4s. 3d. per 1000 feet. The calorific power standard is the level one of 500 B.Th.U. There has been no change in the other matters noticed when reviewing the Bill. [*Parliamentary Agents: Messrs. Lees and Co.*]

In the gas section (referring to Devonport) of the voluminous Act of the Plymouth Corporation, we do not find any departure from the indication given as to the nature of the clauses when reviewing them on Jan. 12, except in one particular. The Corporation then asked to have conferred on them the right to "manufacture, purchase, sell, supply, and deal in" residual products; but the Act contains the model residuals clause *in toto*—that is to say, including the restriction as to liberty to purchase from other gas undertakings only up to the equivalent of one-third of the buying undertaking's own production. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The General Powers Act of the Rhondda District Council contains the one or two provisions referring to gas supply as noted in the review of the Bill; but it is observed that the proposal, among the miscellaneous clauses, as to sanction being conferred to make contributions to funds of associations of local authorities or of their officers, and to defray reasonable expenses incurred in attendances at conferences, has disappeared. [*Parliamentary Agents: Messrs. Torr, Durnford, and Co.*]

The Skegness District Council Gas-Works Purchase Act shows little change from the Bill as originally deposited, and as reviewed in the "Journal" for Jan. 12. Among the conditions is the one that if the Treasury "refuse their consent to the borrowing by the Council of the money required for paying the purchase money, the Company shall not be entitled to require the Council to pay the purchase money until such consent is given or the necessity for such consent ceases." In connection with the power to maintain gas-works, the model provision as to residual products, with the one-third restriction, has here been inserted. The maximum price of gas has been altered from 3s. 6d. to 4s. 3d. The financial powers have been changed somewhat. The Corporation have the power to raise the money required for the purchase, with a repayment period of thirty-five years (instead of forty years, as desired); the sum needed to discharge any debentures, mortgages, obligations, and liabilities has also a repayment period of thirty-five years attached; a sum of £5000 is authorized in relation to the laying of mains and other works for the distribution of gas, with a repayment period of thirty years; the proposal as to working capital has disappeared; but provision is made for paying the costs of the Act and of the Company's Act of 1914, and for raising further money with the approval of the Local Government Board. [*Parliamentary Agents: Messrs. Baker and Sons.*]

In the Act obtained by the Sunderland Corporation for the reconstruction of Wearmouth Bridge, they have power to interfere with gas and water mains and pipes; but both the Sunderland Gas Company and the Sunderland and South Shields Water-Works Company have obtained protective clauses. In the clauses referring to the gas-mains, it is provided that the Corporation shall provide accommodation on one side or both sides of the bridge, and on or under the approaches thereto, or in such other convenient position as may be agreed between the Corporation and the Gas Company for substituted apparatus and for an additional steel main of 8 inches internal diameter for conveying compressed gas; also provide (before interfering with any existing apparatus) substituted apparatus, to the reasonable satisfaction of the Engineer to the Company, comprising two mains each of 18 inches internal diameter with the necessary valves and expansion pipes. All expenses incurred in providing the accommodation, and in laying down the mains of 18 inches diameter, and in altering, diverting, or stopping up any apparatus between specified points are to be paid by the Corporation. But all expenses incurred in the provision of mains, valves, and pipes, and in laying down the additional steel main for compressed gas and the apparatus in connection therewith, are to be paid by the Company. The Company are also to pay to the Corporation £25 per annum; the first payment to be made as soon as the substituted apparatus shall have been provided. In connection with the water-mains, the Corporation are to provide, before interfering with any of the existing apparatus, two mains each of 12 inches internal diameter, with the necessary valves and expansion pipes, to the reasonable satisfaction of the Engineer to the Water Company. The bridge, it may be mentioned, is to have a span of not less than 296 feet. Without the amount required for land, &c., the Corporation are empowered to borrow a sum of £144,000 for the constructional work. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

ELECTRICITY SUPPLY MEMORANDA.

The Unhappy Central Station Engineer.

THE quality and efficiency of local government depend largely on the mental capacity of the men composing the (as the case may be) borough or district council. Where the capacity is of an inferior order, there efficiency is never found; and the lot of the officials is, as a rule, anything but an enviable one. The chief officials of gas undertakings know this. There are some municipal gas men whose official existence is quite a happy one, and who are encouraged, by rational treatment, to do the best that human energy and the extent of the brain power with which they have been endowed will permit. The opposite is also unfortunately true. Electrical engineers have consonant experience. An "Engineering Correspondent" in the "Times Engineering Supplement" refers to the "unhappy" conflicts that take place between central station engineers and their committees or, as a variation, between the former and the consulting engineers appointed by the latter. The text on which the writer expounds his views is "Qualifications for Municipal Work: Tact and Technique." The three main qualifications, in the order of comparative value, which he says the central station engineer requires, are: (1) Diplomatic tact in his relations with the Committee; (2) business sense in his dealings with the consumers; (3) technical skill in the management of the undertaking. The specification is excellent; and while the qualifications are desirable under any set of circumstances, they are not infallible against the formidable pig-headedness and conceit of some of the men who, by the aid of the only thing of which they are possessed—a windy verbosity—are placed in the seats of the local mighty, and there work with a really despotic hand. These are the men, points out "Engineering Correspondent," who, after an engineer has devoted months to perfecting (say) the plans for an extension scheme, reject them, or adopt them in part, or make the engineer feel that complete reliance is not placed on his technical capacity and judgment by calling in a consulting engineer to examine into his proposals. Under such circumstances, all the "Times" writer can offer in the way of counsel is that the central station engineer must give ceaseless attention to the idiosyncrasies and prejudices of these men. Further, he must not neglect to be their elementary schoolmaster in electrical technics and economics; otherwise it commonly happens that some of them will search for knowledge among shift engineers, manufacturers' salesmen, or consulting engineers, and will form obstinate opinions of their own. All this advice is no doubt good, but is not a compliment to the position of the professional engineer (official though he be), or to the manner and methods of some of our local governors.

Training, Position, and the Man.

"Engineering Correspondent" then leads his readers to the threshold of the place where there can and will be eternal discussion as to the best equipment required by an engineer and general manager of an undertaking—such as an electricity supply one. Of course, he considers the matter almost exclusively from the point of view of the municipal engineer; because, relatively speaking—contrary to the conditions in the gas industry—only few electricity supply undertakings are company controlled. However, the described melancholy conditions with which a central station engineer is environed are not what one should expect after a fond parent or a conscientious guardian has spent hundreds of pounds on technical education and adolescent maintenance. From the outset, the young professional is offered a salary less than the equivalent of a trade unionist's rate of wages, and promotion is slow and uncertain. The "Times" writer does not make any suggestions as to how the conditions can be altered. All he proposes is diplomacy, which, in the circumstances, means the insulting of professional position and the bending of manhood, in order that the local bigwigs may feel their own importance and supremacy. This may be tactful; it may be diplomatic. But it does not remove the defects under which local government is carried on to-day, largely through the composition, and indifferent capability of some of the units, of the ruling body. The policy which makes professional training and status subservient to the petty ambitions and conceit of local councillors is not the way to raise the level of the professional man in the municipal world, make his indispensability more keenly recognized, and place him in the position to command adequate remuneration. However, the discussion of the matter by "Engineering Correspondent," which does nothing more than keep us in the same old *cul de sac*, leads him to remark on the type of man best suited to professional work in the electricity industry. He says: "Such technical knowledge and skill as can be bought from the professor and the foreman fetch but a low price when offered in the market for resale. It is the original bent that secures higher valuation, or the practical and sensible opportunism that enables the young engineer to make the most of his market by diplomacy and business push. It will be found that the men who achieve most material success in electrical service, whether as chief engineers of supply undertakings, or as consultants, or as officers of manufacturing companies, possess technical knowledge that is broad rather than deep—for depth can come only by specialization—and that it is their general energy and intelligence that have won them their eminence." There is much truth in the lines quoted, which are some of the best in the article.

Efficiency of Direct and Semi-Indirect Lighting.

In last week's "Memoranda," reference was made to the first of two articles in the "Electrical Review," on the subject of electric-lamp developments, by Mr. L. Crouch. In the second article, he points to the fact that the high intrinsic brilliancy of the metal filament, and particularly the so-called "half-watt," lamp makes concealed or indirect systems essential for interiors. We have frequently pointed to the absurdity, when using these systems, of calculating current expenditure per candle power on the manufacturers' estimate of the efficiency of the naked lamp. Mr. Crouch emphasizes this when, alluding to the Moore lamp, he remarks: "On the plain basis of watts per candle, it is not an efficient lamp, but, allowing for all losses, an overall consumption of 1·6 to 1·7 watts per candle power is obtainable; and *this compares very favourably with the corresponding overall efficiency of most direct* [? indirect] *and semi-direct systems* using high efficiency lamps." In other words, while the efficiency in the case of a "half-watt" lamp is stated as 1 candle per ½ watt (truth puts it nearer 0·75 watt), it is only, when used with indirect or semi-indirect fittings, 1 candle per 1·6 to 1·7 watts. This, therefore, is the efficiency on which, under such conditions, calculations should be made. Incidentally, Mr. Crouch pronounces against the extraordinary uniformity of illumination and absence of shadow produced by indirect systems; his experience being that most people appear to be more or less depressingly affected from entirely indirect lighting, and have a sense of being confined and "on show." Perfect uniformity of lighting is not natural; it is essentially artificial.

Hospitals and Electrical Failures.

It is generally known that quite a large number of electrically lighted places to which the public resort have a stand-by system of gas lighting. Some hospitals and infirmaries, also electrically lighted, where there has been unpleasant experience through the collapse of "fickle electricity" supply at an inopportune time, have likewise stand-by systems. And it is highly necessary they should have. To have a collapse of lighting during a critical operation may mean the death of a patient. The "Lancet" recently called attention to a case of an electric lighting collapse during an operation; and "Electrical Industries" comments on it. During one of the air-raids on the East Coast, a well-known surgeon was performing the operation of tracheotomy at a nursing-home, when, through the appearance of enemy aircraft, the current was switched-off at the main. At the moment, the surgeon was busy at a most critical part of the operation—that of opening the windpipe. Fortunately oil-lamps were kept in readiness in the institution for any sudden failure of the electric current. "Electrical Industries" admits that there may be hundreds of hospitals and nursing-homes where a sudden failure of the light might occur any night "not only from Zeppelin causes, but by an accident at the station or to the mains." It is thought that the situation gives electrical contractors a first-rate chance to push the claims of an auxiliary lighting service from storage batteries. It has also been found that failures of electricity supply have been excellent opportunities for pushing the claims of gas lighting; and this has been done with good effect. Even oil-lamps afford greater reliability, and are much cheaper, than a sufficient installation of electric storage batteries. Moreover, one never really knows what is going to be the duration of an electrical failure.

Electric Cooking in Hotels, &c. The "Electrical Times" would be glad to hear from anyone who knows of hotels in this country in which electricity is the sole cooking agency. Not even by the exhilarating aid of "the spur of the moment," can our contemporary call to mind any hotel in such a "happy" position, although it asserts there are several on the Continent and in the United States. However, our contemporary points to a number of restaurants and institutions which, it declares, depend "exclusively" upon electric cooking. These are: The B. and K. Restaurant, Earl's Court Road; the Tricity House, Oxford Street; the Regent Street Polytechnic; the Bradford Corporation Kursaal; the Pavilion, Torquay; the Blackpool Tower; the Cavendish Restaurant and Whitehall Café, Derby; the Orleans Club, St. James's; and "several" others. Now is it true to say that all these places depend "exclusively" upon electricity for "cooking?" Our contemporary does not state how many of them are purely advertisements, and how many of the "others" are under direct electrical patronage, and almost daily the solicitous care of the local electrical staff. Then the story proceeds: There are many staff kitchens attached to large business houses in which electricity is employed "throughout" for cooking. It would be very interesting if our contemporary would check the word "throughout" in relation to some of the establishments referred to. Among institutions, it says, may be mentioned: Park Prewett Asylum, Hampshire; the Fever Hospital, Derby; the Empire Hospital, Westminster; a large hospital at Sheffield; a large institution at Leatherhead; and a "number" of nursing homes in London and the Provinces. The Old Ship Hotel, Brighton, "depends mainly" upon electricity. Does it? As will the Brighton Pavilion when it resumes its normal *rôle* of furnishing banquets, instead of accommodating wounded Indian troops; while many other hotels, restaurants, boarding-houses, and nursing homes are actually installing electric cooking apparatus to supersede gas and coal, or are about to do so. It is all wonderful and nicely put—from the electrical point of view. But there are other sides to the tale.

Fires at Electricity Stations. The "Electrical Times" says there have lately been an uncomfortably large crop of fire outbreaks at electricity stations. There was the recent one at Ebbw Vale, when the power station was gutted, the district deprived of current, and nearly 10,000 men thrown out of employment. Other reports of fires at electricity stations have recently come along; and our contemporary is "tempted to think very furiously of such events." In its opinion, it is an immense pity that guards are not provided for electricity stations from the regular and volunteer forces. Why do not the electricity stations provide their own sentries the same as many gas undertakings have done. However, guards from the national and volunteer forces could not have prevented lightning, causing (as it did on the 16th ult.) a fire at the Ipswich power station, and blowing fuses in the distributing mains. There was not much damage done to the electrical station; but the lightning striking the tramway trolley wires affected the automatic switches at the station. In the eastern district, current was cut-off from some of the consumers. An overhead electrical cable supplying power to a workshop was brought down. At the Ranelagh works of Messrs. Reavell and Co., the machinery is run by electricity, and the fuses were blown, putting practically all the machinery out of action. Through the blowing of fuses, the electric power was also cut-off at the St. George's Motor Works. Nor could a blaze, on the 22nd ult., at the Belfast Corporation Electricity Works have been prevented by guards from the regular or volunteer forces. This fire was attributed to the spontaneous combustion of coal. The conflagration was very fierce; but the fire was kept from the main engine room and plant. About 2 a.m. some boiler hands found that one circuit of the local electric lighting had broken down; and this led to the further discovery that spontaneous coal combustion was in full swing. It is strange that the spontaneous combustion of the coal was not discovered before it had got such a hold that it set the roof woodwork alight. Spontaneous combustion of coal is not something that develops "full swing" all at once. It is interesting to learn that the "Electrical Times" thinks that if sentries had been patrolling the various frontages, they would have noticed the fire; for the "burning roof must have been conspicuous from outside long before the stokers became aware of it from within." Let it stand at that; only readers will understand the statement emanates from the "Electrical Times."

Manchester and District Junior Gas Association.

In a joint circular letter to the members, the President (Mr. S. Carter) and the Hon. Secretary (Mr. J. Bridge) of the Manchester and District Junior Gas Association, say the Council much regret that they find it impossible to make satisfactory arrangements for the current session, and the following resolution was passed at the last meeting: "Resolved that the proceedings of the Association be suspended for the duration of the war; that the officers recently elected retain their position; and that the Council meet and arrange for meetings, &c., as soon as more peaceful times prevail." It is proposed not to solicit subscriptions until the meetings are resumed.

UNIVERSAL CALORIFIC STANDARD FOR CANADA.

A Marginless 520 B.Th.U. Standard Adopted.

Through the courtesy of Mr. Ormond Higman, Chief Engineer of the Department of Inland Revenue, we are enabled to publish an Order in Council—passed under the provisions of Section 1 (sub-section *c*) of the Gas Inspection Amendment Act, 1910, and dated June 26, 1915—establishing a calorific standard for the determination of the heating value of manufactured gas throughout the Dominion of Canada. Mr. Higman writes from the Electrical Standards Laboratory, Ottawa, under date of Aug. 19. The following are the

Regulations.

These regulations are to be construed as subject in all respects to the provisions of the Act; and the several words, terms, and expressions to which by the Act meanings are assigned shall have herein the same respective meanings.

1.—British thermal unit (B.Th.U.) means the quantity of heat required to raise the temperature of 1 lb. avoirdupois of water from 60° to 61° Fahr.

2.—There shall be provided and maintained in proper working order by the department at each departmental testing-place suitable apparatus for testing the calorific power of manufactured gas supplied at such testing-place, and such apparatus, and the method of making the test, shall be such as shall from time to time be determined by the Minister.

3.—The following provisions shall apply with respect to the testings of calorific power made with the apparatus and at the test-places provided in accordance with the requirements of the preceding section:

(*a*) Any inspector of gas appointed under the Act may, by means of the apparatus provided as aforesaid, test at the prescribed testing-place, at any reasonable hour, the calorific power of the gas supplied at such testing-place; but not more than one testing for calorific power shall be made on any one day except in the event mentioned in sub-section (*f*) of this section.

(*b*) The undertaker may, if he so desires, on any occasion of the testing of the gas under the provisions of this section be present, either in person or represented by some officer whom he may appoint. Such representative, however, shall not interfere with the testing.

(*c*) The calorimeter shall be so used as to yield the total heat which shall be developed by the complete combustion in moist (saturated) air of moist (saturated) gas; and the products of combustion shall leave the calorimeter at approximately the temperature of the inlet water.

(*d*) Subject to the provisions of the next preceding sub-section, the testing shall be made in the manner and under the conditions for the time being prescribed by the Minister.

(*e*) The result obtained by means of such testing shall be expressed in terms of British thermal units per cubic foot of gas, and shall be corrected for a temperature of 60° Fahr. and a pressure balanced by a column of 30 inches of mercury at the same temperature. The corrected result shall be the calorific power of the gas determined by the testing.

(*f*) In the event of the calorific power, on any testing, being found to be below the standard calorific power, the undertaker shall be immediately notified in writing, and a second test shall be made on the same day, but at an interval of not less than one hour from the time of serving the notice on the undertaker; and the average of the two testings shall be the calorific power of the gas on that day.

(*g*) Any party may, at any reasonable time, after depositing the fee, demand a test of the calorific power of the gas supply. In the event of the calorific power determined by the test being below the standard, the cost of the test shall be paid by the undertaker; if at or above the standard, by the party demanding the test.

(*h*) The Inspector shall, not later than the day following that on which any testing has been made under this section, make and cause to be delivered to the undertaker a report of the result of his testing, and such report shall be received as *primâ facie* evidence of the facts therein contained.

The Standard of Calorific Power.

4.—The standard calorific power of the gas supplied by the undertaker at the prescribed testing-place shall be 520 B.Th.U. per cubic foot of saturated gas when burned in saturated air and the volume of gas corrected for a temperature of 60° Fahr. and a pressure balanced by a column of 30 inches of mercury at the same temperature.

Provided that the undertaker shall not be liable for more than one penalty in respect of a deficiency of calorific power of the gas at any testing-place on any one day.

Penalties for Deficiency of Calorific Power.

5.—If on any day the calorific power of the gas tested in accordance with the provisions of these regulations is below the standard calorific power prescribed, the undertaker shall be liable to the following penalties:

(*a*) Companies having over ten thousand (10,000) meters, $80 for the first offence, and double this penalty for each subsequent offence.

(*b*) Companies having five thousand and one to ten thousand (5001 to 10,000) meters, $60 for the first offence, and double this penalty for every subsequent offence.

(*c*) Companies having two thousand and one to five thousand (2001 to 5000) meters, $40 for the first offence, and double this penalty for every subsequent offence.

(*d*) Companies having one thousand and one to two thousand (1001 to 2000) meters, $20 for the first offence, and double this penalty for every subsequent offence.

(*e*) Companies having one thousand (1000) meters and under, $10 for the first offence, and double this penalty for every subsequent offence.

SAVING CLAUSE AS TO PENALTIES.

6.—Notwithstanding anything contained in these regulations, no penalty shall be incurred by the undertaker for any deficiency in calorific power in the gas tested in accordance with the provisions herein contained in respect of which the Inspector reports, or it is proved, that such deficiency was produced by any circumstance beyond the control of the undertaker. Provided that want of sufficient funds shall not be held to be a circumstance beyond the control of the undertaker.

PROCEDURE.

7.—All penalties imposed under the authority of these regulations shall be recoverable on summary conviction in accordance with the provisions of section 62, 63, and 65 of the Gas Inspection Act, Chapter 87 R.S.

8.—These regulations shall come into force and be operative from and after the 1st day of July, 1915.

9.—All previous Orders in Council and regulations relating to the testing of the illuminating power of gas and in respect of sulphur and ammonia tests are hereby repealed.

J. U. VINCENT, Deputy-Minister.

ORMOND HIGMAN, Chief Engineer.

[This Order is referred to in our editorial columns.—ED. J.G.L.]

COKING AND BYE-PRODUCTS.

By "Event and Comment."

SCIENCE, INDUSTRY, AND BYE-PRODUCT COKING.

THE forthcoming meeting of the British Association will be held this year at Manchester under exceptional circumstances; and now that we have had a full year of war in which to enable us to realize to some extent the amount we were dependent on German science and German industry, we may surely expect that the addresses at the meeting will give full vent to British scientific opinion on these matters. It is evident enough that our dependence on Germany is not due in any way to superior scientific traits of the German people, but rather to the superior organization of their scientific resources, and a proper regard for the relationship which should exist between science and industry.

If there is any outstanding point for regret in connection with the character of the British Association meetings, it is that sufficient is not seen of the scientific men who are associated with the practical side of industry. There are, of course, departments in connection with our higher education system which pretend to give a practical insight into various industries. In some cases they have been successful but in others they have been a distinct failure, and in the latter—in the writer's opinion—the cause of the failure is almost invariably the fact that the head of affairs is a man who is lamentably lacking in practical experience. There seems to be an idea in the minds of those who are responsible for the appointment of such men that there are no suitable scientific men in the ranks of practical workers. There appears to be a kind of intellectual contamination about a works which bars the individual concerned from obtaining any high position in the educational world however suitable he may be in other respects. How many professors and lecturers in industrial subjects at our various universities, technical colleges, &c., have any real practical experience? How many of the estimable gentlemen who read learned discourses on technical subjects have ever actually been in charge of the operations they so fulsomely describe? Much of the information contained in the papers is not the record of their own experience, but of some despised practical man; and the account of such experience would come with much more force from the practical man himself.

In view of the fact that bye-product coking is playing such an important part at the present time in supplying munitions of war, and will after the war continue to be an important adjunct to the establishment of the synthetic dye industry in this country, it is not at all unlikely that it will be frequently mentioned during the meeting of the Chemical Section, and in more or less detail. As a general rule at such meetings a vast amount of inaccurate information is disseminated, and many crude suggestions are put forward as to what ought or ought not to be done. If the subject is worth dealing with at all, it is worth being dealt with properly; and the writer would suggest—as with bye-product coking, so also with other sections of industry—that sectional meetings should be arranged, and men intimately connected with individual subjects invited to attend, read papers, and take part in the discussions. Get the practical men on the job—the men who have to face the actualities of the subject every day of their lives. These men, combined with the eminent scientists who are themselves interested in the subject, would be far more likely to evolve something useful than either group alone, and the meeting could then truly call itself the British Association for the Advancement of Science. At present it is too ethereal and almost too impossible from the industrial point of view.

THE RECOVERY OF TOLUOL.

A short time ago some remarks appeared in a leading article in the "Yorkshire Post" on the subject of the recovery of toluol, to the effect that "few coke-making plants in this country are fitted with the apparatus for the recovery of bye-products, and that therefore Great Britain has to depend entirely on the gas-works of the country—all, or nearly all, of which . . . save their toluene." The "JOURNAL" rightly pointed out that the writer of the article had "had a fall." In last week's "JOURNAL" (p. 458), a letter appeared from this gentleman defending his original statement, and citing in evidence a letter by "H. J. H.," which also appeared in the "Yorkshire Post." "H. J. H." quotes figures from the Mines Report of 1914, which state that in 1913 there were working 13,167 beehive ovens and 7839 bye-product ovens; and he leaves it to be implied from this that these numbers represent the proportion of coal carbonized in the two systems. While agreeing that coke-ovens are doing far less than they might and should—as stated in the letter to the "JOURNAL" referred to above—the writer should discriminate between bye-product ovens and beehive ovens. It takes both time and money to build bye-product ovens; and it is safe to say that at the present time bye-product oven people are doing all that is possible to help. Beehive oven people are doing nothing—that is, from the toluene point of view. Contrary to the implication conveyed by the figures given above, calculations show that most probably about 55 per cent. of the total amount of coal carbonized for the production of metallurgical coke is dealt with in bye-product ovens in this country, and the remaining 45 per cent. in beehive or other non-recovery ovens.

The writer of the letter to the "JOURNAL" then goes on to make the following absurd statement:

> If the gas-works are not yet doing all they might in regard to the production of toluol, the coke-ovens as a whole are doing much less.

Let us look at the position fairly for a moment. With the exception of a few of the larger gas-works, the only source of toluene from gas-works is the coal tar.* Modern methods of carbonization—*i.e.*, high heats—are not favourable to the production of a tar especially rich in toluene. Coke-oven conditions are, if anything, the more favourable of the two; but let us call them equal. The tar from one ton of coal produces probably not more than one-fortieth of a gallon of toluol. Let it be assumed that approximately 20 million tons of coal are carbonized per annum at gas-works and 15 million tons at bye-product coke-works. This means that the former will produce 500,000 gallons of toluol and the latter 375,000 gallons. But 80 per cent. of coke-ovens recover crude benzol; and this, at a very modest estimate, yields one-fifth of a gallon of toluol per ton of coal carbonized. Taking, therefore, one-fifth of a gallon for 80 per cent. of 15 million tons of coal, there are obtained as the production from this source 2,400,000 gallons—a total coke-oven production of 2,775,000 gallons—against 500,000 gallons from gas-works. Much, of course, remains to be done on coke-ovens, but on those of the beehive type.

Some correspondents have commented on the fact that there are still a large number of bye-product ovens not recovering benzol. This is quite true; but it must be borne in mind that the majority of such ovens are dealing with low volatile coal, which yields very little benzol—or toluene—at all, and that in these cases it is hardly worth recovering.

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* A considerable number of gas-works—medium sized and small, as well as large—are to-day tar washing their gas, and so largely increasing the quantity of toluol in the tar.—ED. J.G.L.

Gas Manufacture and Cyanide Processes.—In the course of an article dealing with cyanide processes in last Friday's Engineering Supplement to "The Times," the writer, referring to the indirect advantages of removing cyanide from gas, says that, apart from the fouling of gasholder water, and the possible corrosion of gasholder plates and other apparatus, the removal of the cyanide is strongly to be urged, owing to its effect on the efficiency of the purifying material. It is beyond all question, he continues, that oxide of iron, whether natural or artificial, will remain in active condition for a much greater length of time when the cyanides are absent—so much so that both Bueb and Guillet have shown that in some cases the efficiency of the "dry" purifiers may be increased by 50 per cent. if the compound is extracted. Perthuis, too, has pointed out that in certain circumstances cyanogen is responsible for a reaction—not wholly understood—in purifiers which may cause the material in them actually to increase the sulphur impurities in the gas. On works where no recovery plant for cyanogen is in use, the bulk of the substance will be removed by the oxide or lime purifiers, although some slight reduction will take place during the passage of the gas through the wet purification plant.

THE MONO-RAIL TELPHER.

ITS INSTALLATION, CARE, AND MAINTENANCE.

By H. C. Widlake, M.J.Inst..E., of the Plymouth and Stonehouse Gaslight and Coke Company.

(*Continued from p.* 456.)

Special Branch Track Switch.

An appliance which adds greatly to the adaptability of the mono-rail telpher is the special track switch used by Messrs. Strachan and Henshaw, previous to the introduction of which particular trouble was generally experienced in devising a safe and really reliable method of diverting the telpher machine on to branch tracks from the main line, on account of the difficulty in providing for the smooth running of the machine over the junction, the objection to breaking the main track, and the difficulty of providing for proper continuity of the overhead electrical supply wires, which have, of course, to operate simultaneously with the track switch.

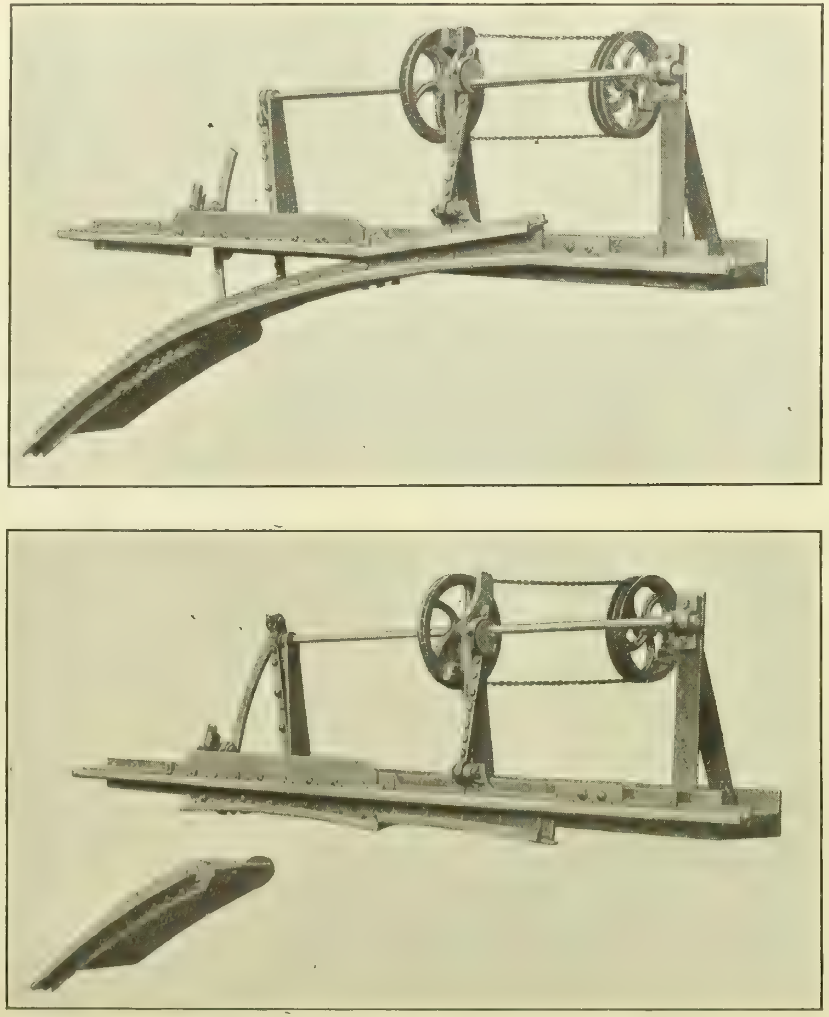


Fig. 3.—Strachan and Henshaw's Branch Track Switch.

By the adoption of this switch, all these difficulties have been successfully overcome. The system is easily applicable to either single, double, or treble overhead trolley systems; while the continuity of the main track joist is not broken or interrupted in any way. The tendency of the track to spring when the main joist is broken is thus avoided, and the rigidity of the track is maintained. No difficulty has been experienced in mating-up the end of the branch rail with the moving rail; and the smooth running of the machine through the junction is assured.

There is nothing elaborate about the switch, which is of simple construction, and the operation is a very simple matter. As may be seen from fig. 3, it is of very substantial construction, and can be operated with ease either from the ground—when it would be provided with an additional locking device so as to prevent unauthorized handling—or by the telpher driver, within whose reach the operating lever can be easily placed. It may be operated instantaneously; while the switch is self-locking in either direction. As stated, the overhead wiring switch operates simultaneously and automatically with the track switch, and a smooth path is provided for the current collectors; so that the switch is negotiated without the occurrence of jerks or arcing.

When it is so desired, provision can be made for the current to be automatically cut off from the branch track when the latter is not in use—a device which has been found of considerable advantage when any work is being carried out on the telpher itself or on its overhead equipment. Many of these switches are already in operation, and are attracting great attention by reason of their usefulness.

The Automatic Weigher.

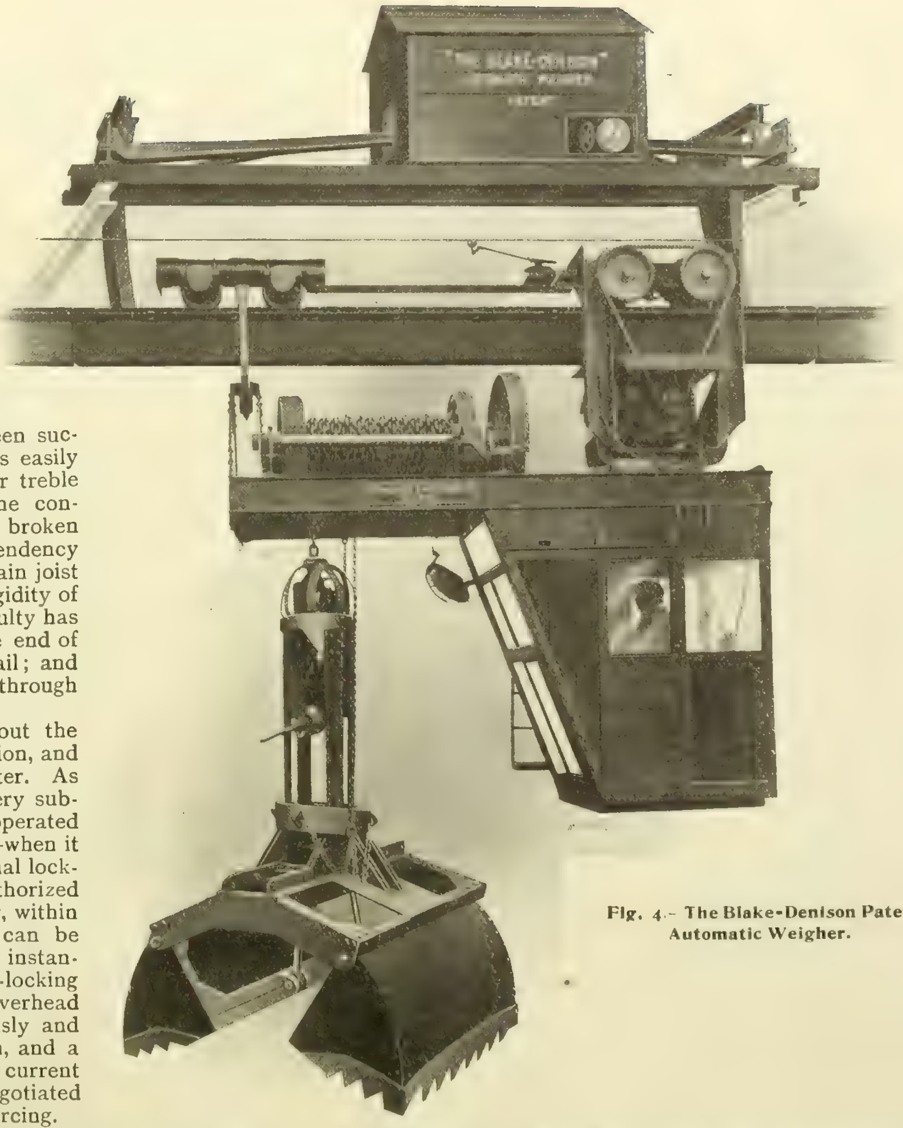


Fig. 4.—The Blake-Denison Patent Automatic Weigher.

Fig. 4 shows the Blake-Denison weigher, which has been in several instances used most successfully in conjunction with telpher installations. The weighing machine mechanism may be placed either on suitable girders above the track or on the ground. The portion of the telpher track to which the weigher is attached is provided with substantial safety stops, and is perfectly free to move vertically for a limited distance, in order to transmit the load to the weigher. Means are also provided for leading the telpher machine smoothly on and off that portion of the track, as also for preventing longitudinal motion of this rail.

The weigher automatically aggregates upon a recorder the net weight of the material carried by the telpher grab or skip; there being an adjustment on the weigher to balance the tare weight of the machine and its fittings. During the period of weighing, which takes about five seconds, the total weight of the telpher and load is supported by the weighing rail. The machine can proceed on its journey at the expiration of this five seconds; the recording taking about 30 seconds. This is automatically performed by the weigher, which is operated by means of a ½ H.P. motor running continuously. The motor is put into action automatically by the actual weight of the material carried on the suspended track, and stops again on the completion of the cycle. These weighers are guaranteed to weigh accurately to within ½ per cent. of the aggregate loads carried, and are recognized and stamped by the Government Weights and Measures Department.

HANDLING HOT COKE.

Telpherage is admittedly not applicable to all retort-houses, on account of structural objections; but the admirable manner in which these installations are dealing with hot coke discharged from the retorts of a large and ever-increasing number of works is making the telpher a serious rival to all other forms of conveyors for this purpose, in respect to both horizontal and vertical installations. Except in cases where the run between the retort-house and the coke storage heap or bunkers is excessive, it will be found that a one-machine installation will deal with the hot coke as quickly as one retort-discharging machine can push it out.

The usual practice is to push hot coke direct from the retorts into lattice bar skips, three or four of which are placed in readiness on the drawing stage in front of the benches. These skips, as they are filled, are lifted and conveyed in rotation from the retort-house to the quenching tank and coke yard; the telpher depositing each empty skip again on the drawing stage in advance of those already there waiting their turn for handling. In this way the machine can do its work continuously without hindrance or loss of time, and so keep up with the charging machine.

It is usual to carry the contents of two retorts in each skip load; but in some works, where the discharges are not too large, the contents of three retorts can be handled at each trip—about 25 to 28 cwt. of hot coke being the maximum quantity that can be conveniently quenched at one time.

After quenching, the coke may be conveyed direct to the coke heap, hoppers, screens, or railway trucks, as desired; the skip being lowered out as far as possible, so as to ensure a minimum fall for the contents. By so operating, it is found that breakage of the coke, and consequent accumulation of breeze, is reduced to a minimum.

The skips are of heavy construction, to stand the varying conditions of temperature and hard usage, and are carefully balanced so as to be self-tipping when full, and to automatically right and lock themselves when empty. The tipping action is controlled by a following cord from the compensating gear fixed in the driver's cabin. The time taken by the cycle of work will, as has been pointed out, depend upon the actual run which the machine has to make to discharge its load, and also, in a lesser degree, upon the height of the hoist from the discharge stage and the quenching tank. The latter, it may be remarked, should be so placed as to reduce the required amount of raising and lowering to a minimum—consistent, of course, with safety as regards the driver's outlook.

The main time factors in the foregoing operation will be: (*a*) Hoisting loaded skip; (*b*) travelling to quenching tank, storage bunkers, and return; (*c*) lowering loaded skip into, and raising from, quenching tank. Assuming a travelling speed of 600 and a hoisting speed of 60 feet per minute, and that the single journey from the retort-house to the storage, *viâ* the quenching tank, is 300 feet, we can time these operations as follows:—

	Seconds.
(*a*) Hoist (say) 25 feet	25
(*b*) Travelling 600 feet, *plus* allowance for acceleration and slowing up	80
(*c*) Operations at quenching tank	30
Allowing say 30 seconds for the other shorter operations .	20
Total	155

From this figure it will be apparent that the machine will handle 20 cwt. (or three retort loads) on a 300 feet run in 155 seconds, or under one minute per retort. The writer's experience with the new two-motor Fiddes-Aldridge machine, built especially for the Plymouth and Stonehouse Gas Company is that a minute per retort is a very fair average performance.

Fig. 5 shows a telpher installation for dealing with hot coke at the Adderley Street Gas-Works of the Birmingham Corporation, from which it will be seen that the skips are so placed as to cover the mouthpieces of two retorts. The installation of a telpher plant certainly conduces to better working conditions in the retort-house, and enables the drawing stage to be kept perfectly dry

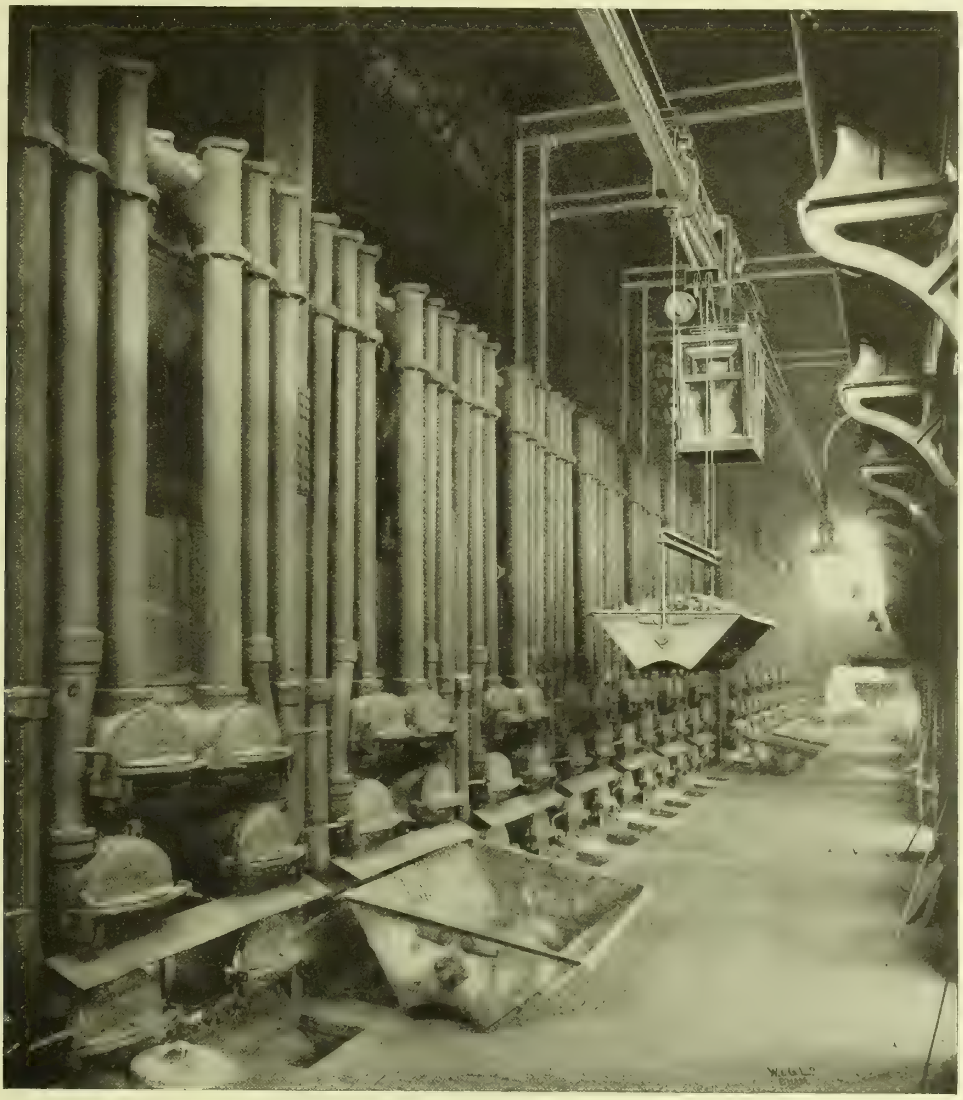


FIG. 5.—THE HOT COKE TELPHER AT THE ADDERLEY STREET, BIRMINGHAM, GAS-WORKS.

and clean; while the small power required for driving and the low maintenance charges render the use of the mono-rail telpher a very attractive proposition. Among the other advantages may be named: (*a*) Breakage of coke reduced to a minimum; (*b*) simplicity of construction and ease of extension; (*c*) all working parts removed from the influence of coke and heat.

BERTHING.

A point often neglected in telpher installations, but one to which too much attention cannot be paid, is the question of providing adequate berthing accommodation. If the plant is situated entirely in the open, the first requirement is, needless to say, efficient protection from the elements. It must be remembered that at times the machine will have to be taken in hand for overhaul or adjustment; and the degree of thoroughness with which work can be carried out will largely depend on the accessibility of the machine and the facilities provided for safe working.

Tackle will have to be rigged, motors slung, and lifted out; and only those who have had to carry out such work hanging on by their eyelashes, so to speak, can really appreciate the benefit of a well-designed berth. The machine should berth alongside a substantial, well-guarded platform on which men can safely stand, tools be laid out, and minor fitting jobs be effected.

The electric supply to the trolley line should be controlled from this platform by means of a double pole switch and fuse, and tappings should be taken from the station side of the switch to provide adequate lighting and to supply two or three plugs, into which hand lamps can be inserted. This arrangement will enable all current to be switched-off the telpher circuits while retaining the use of the power for lighting purposes.

TROLLEY WIRES.

In the working of a mono-rail telpher upon a direct-current system there are two possible arrangements of the overhead trolley system—namely, the double-pole system and the single-pole system. In the former, two overhead conductors are employed. They are insulated from the running girder and from each other, and deliver and collect current to and from two separate and independent collecting arms fixed on the upper frame of the telpher machine. The single-pole system, on the other hand, is far simpler, and involves the use of only one trolley wire and one trolley on the machine itself.

With the double-pole system the positive bus-bar at the generating station is connected to one of the trolley wires and the negative bus-bar to the other. The current comes from the positive wire into the telpher *viâ* the collecting arm, and, passing through the motor and controller circuits, is returned to the station *viâ* the negative trolley arm and overhead wire. At no point of a properly-maintained double-pole system does the pressure attain "earth" potential, but keeps a certain value above and below this pressure according to the state of the insulation of the wire and the fittings.

With the single-pole system, however, the trolley wire delivers current to the machine *viâ* the one trolley arm, and the current passes through the motor and controller circuits and finally to the frame of the machine itself, to which the electrical equipment of the machine is in this system connected. From the frame of the machine the current finds its way into the running rails *via* the point of contact made by the wheels with the rail on which they run; the rail being connected by a conductor—not necessarily insulated—to the generating station negative bus-bar.

A telpher installation arranged on this system is electrically the same as a street tramway undertaking; but the necessity for electrically bonding the rails does not exist to the same degree as in the street-car system, as if the joints between the rails and the fish-plates are, during erection, kept fairly clean, the cross sectional area offered by these joints for the flow of the comparatively small—in the case of the telpher—return current will be ample to ensure its passing the joints without any appreciable drop of potential. In this connection, however, it must be remembered that an unbonded telpher track will certainly conduce to an objectionable drop of potential provided any electrically poor joints exist; and this will be shown by a diminution in the power available at some particular point of the track, or a dimming of the lights when, in its travel, the machine places such a joint between itself and the source of the power. With a continuous loop-track this trouble is less likely to show itself, and in any case may be regarded as remote.

In any electrical system the occurrence of certain cable faults may result in the setting-up of heavy earth currents—namely, currents which are "straying" and are endeavouring to pick up a path to their ultimate destination by flowing through the ground and through any metallic substance which they may find buried therein. Flowing between two such faults, and in a locality abounding in gas and water pipes, such currents may quite likely prove a source of danger unless provision is made for confining them to well-defined and harmless paths, for which reason alone —and there are many others—it is particularly desirable to maintain one side of the system at earth potential.

Assuming that for the above reasons it is decided to work the telpher on the single-pole system, the portion of the structure on which the telpher running beam rests should be electrically connected to the running beam; and provided it is a steel structure [otherwise the running beam itself should be connected to the return conductor], the point nearest the generating station should be connected to a copper conductor of ample area, carried back through the ground to the generating station and there connected to the negative bus-bar. In no circumstances should a fuse or other circuit-opening device be placed in this return feeder; its object being to maintain the negative bus-bar and the telpher running beam at a harmless and unvarying potential.

On such a system it is usual to connect the negative bus-bar independently to an earth plate of ample capacity, buried in the ground near the switchboard, and connected to the bus-bar through a high-capacity shunt and a low-reading ammeter, for the purpose of detecting earth currents. This ammeter should give no reading providing the system is in proper order; and any current showing on it will give timely warning that a fault has occurred on the network, and that currents are returning to the station *viâ* the earthing plate—namely, outside the metallic circuits which are provided for their safe return.

(*To be continued.*)

A COKE-OVEN EXPERT'S VIEWS ON THE RECOVERY OF BENZENE, TOLUENE, &c., FROM COAL-GAS.

FROM benzene and toluene being classified by the chemist as coal-tar derivatives probably arises a mistaken popular impression that the chief source of the country's supply of these products is from the distillation of tar. Such, however, is not the case; the amount carried forward in the gas being invariably many times the amount deposited with the tar. Thus in regard to toluene—speaking not of the total amount, but of the amount which in practical working it is possible to recover in a pure form—one may say that while from 0·01 up to possibly 0·05 gallon can be extracted from the tar from one ton of coal, from over 0·20 to as much as 0·50 gallon can be recovered from the gas after the tar is deposited. The figures are variable in both cases for different coals, and even for the same coal when differently treated; but in general, under equal conditions, freshly-wrought coals from the pit, and from the same district, show a yield of products roughly in coincidence with the percentage of volatile matter in the coal. Outcrop, stock, or weathered coal does not conform to this rule, but gives a low yield.

The majority of bye-product coke-ovens working in this country recover benzol and toluol. Some recover it in a crude form as naphtha, from which refiners manufacture pure products; but in most of the large installations the manufacture is completed at the coke-works. The coke-oven process is a simple one; the difficulties lying in the detailed application. After the ammonia has been recovered, the cooled gas, at a temperature of 60° to 65° Fahr., is washed with cold absorbing medium, also at about 60° to 65° Fahr. This absorbing medium is then heated, and the products driven off by steam.

In coke-oven practice it is generally recognized that the best commercial medium for the absorption are those light creosote oils from tar which distil between 220° and 250° C. Heavier oils, distilling at from 250° to 300° C., are not quite so good, but nearly so. In commerce, the lighter oils have a tendency to carry dissolved naphthalene; and the heavier oils carry more pitch—both of these substances being objectionable. There is not much difficulty in getting wash oil which shows no distillate at all below 220° C., and 90 per cent. distilling between 220° and 270° C.; the fraction from 220° to 250° C., upon standing overnight at normal temperature, showing no deposit of solid naphthalene. Such oil is in general use; but in use it deteriorates from causes afterwards explained.

The scrubbing area required for benzol recovery is about the same as is usual for ammonia; and it is a matter of some indifference whether ordinary scrubbers, washers of the Livesey type, or rotary washer-scrubbers are used. The latter possibly give the best results, but the former are in more general use. As a general rule, two or more scrubbers in series are provided.

The absorption of benzol, &c., is to a large extent dependent upon questions of vapour tension, &c.; and to secure the best results it is necessary that the oil should not be circulated, but should pass directly through the system in opposition to the flow of gas. The debenzolized oil leaving the stills, after cooling to 60° to 65° Fahr., is pumped into contact with the leanest gas, and upon leaving the unit is pumped bodily into the next one, until, finally leaving the system from contact with the richest gas, it contains from 2½ to 3 per cent. of products.

When complete recovery is the objective, a lower saturation calls for more distilling plant; while with a higher saturation the loss of unrecovered products increases. It is imperative that the oil flow should coincide in volume with the saturation obtained, so as to recover the full output; and as the oil constantly passes through heaters, stills, coolers, and scrubbers, it is necessary that the heaters, stills, and coolers should always be well in excess of theoretical requirements. Thus a plant to recover 2 gallons of products per ton of coal, from 400 tons of coal per day, requires, with $2\frac{1}{2}$ per cent. saturation in the oil, that the stills should deal with a minimum of 32,000 gallons of oil per day; and if they cannot do this, increased scrubbing plant is of little avail. That heaters, stills, and coolers should be well above their capacity is essential to the complete recovery process.

In distilling the oil, it is necessary to heat it to 115° C. prior to allowing it to come in contact with the direct steam used in the still to vaporize the products and carry them over into the condensers. This temperature is necessary to secure a thoroughly debenzolized oil. It is essential that the oil be at least over 105° C. before coming in contact with direct steam; otherwise steam is condensed, and water accumulates in the oil, from which, with commercial creosote, only distillation can separate it. This is most detrimental, because water being roughly twice the specific heat of oil it diminishes the distilling power, and through this, and dilution of the oil, lowers the scrubbing efficiency as well, besides which there is also ample evidence that if the water exceeds 3 per cent. or so, corrosive actions are developed upon the heater coils, &c., which increased amounts of water accentuate to such a degree that a new heater-coil has been known to be pitted through with innumerable holes inside 48 hours.

It is not general in coke-oven practice to use the hot outflowing oil from the still for heating cold inlet oil, except (say) through the first 30° C.—to about 50° C.—because, compared with other means, such a plant would be both cumbrous and expensive. It is more usual to heat the cold oil by utilizing the outgoing steam and vapours from the still in indirect contact; and there are plants at work with such heaters raising the oil to 60° and 80° C. Supplementary to these preliminary heaters there is usually an indirect steam-heater, in duplicate, as a provision against corrosion troubles, &c.; the heating surface usually being solid drawn tube in the shape of a coil. This heater should, if possible, be supplied with high-pressure or superheated steam. The transfer of heat from the heating means to the oil is governed by the difference in mean temperature on each side of the plate, which is the reason why high-pressure or superheated steam is preferable, and why the outlet oil cannot be used economically above a certain point for heating the inlet oil.

Preliminary heaters are not a necessity; though their use is economical. The whole of the heating can be done by an indirect steam-heater. No indirect steam-coils are usual in modern stills. The maximum temperature is attained in the preheater before the oil enters the stills; and as upwards of 90° C. oil starts to give off vapour, a space of 18 inches or so is allowed at the top of the heater above the oil outlet level, which is connected by a pipe to the vapour space of the still itself. Otherwise, on entering the still, the oil would froth over into the condenser.

The still itself is designed to bring the oil in close contact with direct steam which is blown in at the bottom, and bubbles through trays containing the heated oil passing downwards, carrying with it the products, as vapour, into a water-cooled condenser. The condensed liquids run mixed into a separator, which, by the action of gravity, separates the products from the water. The heated oil enters the still from two to three feet below the still-head, to allow for any frothing which may occur; and above this space a simple form of dephlegmator is usually placed—the best form being the indirect preliminary oil-heater referred to above. Leaving the still by means of a seal pipe or syphon, the debenzolized hot oil passes through coolers back to the scrubber pumps. A coil of cast-iron pipes, water-sprayed to keep the surfaces moist, if of sufficient area, is as useful for this purpose as any elaborate apparatus.

The product is now crude naphtha, containing from 70 to 80 per cent. of benzol, &c.; the balance being creosote oil with some naphthalene. Where naphtha as such is delivered to refiners, there is thus a constant loss of creosote oil from out of the wash-oil, and, through the creosote replacing this being impure, a constant increase of pitch in the oil; so that periodically the whole of the oil has to be changed or renewed. On the other hand, where the coke-ovens make refined products, an accumulation of naphthalene has to be guarded against by similar means. For these reasons, the plants are usually designed to work with a minimum stock of oil.

The process of refining naphtha is fully dealt with in several technical works; and the process need not be detailed. It is necessary to point out that here, also, the separation of the largest amount of pure products depends upon ample still power and dephlegmating surface being provided. The greater the reserve in these respects the greater will be the yield of pure products. An understanding of the properties and separation by fractionation of benzene, toluene, xylene, &c., from mixtures of the same, points to Dr. Davidson's process being more than feasible; and from observations of defective coke-oven practice, in which complete recovery was not attained, corroborative evidence can be advanced. When considered in the light of Dr. Davidson's discovery, three instances will perhaps suffice to illustrate this.

In the early days, benzol, &c., was recovered by plant consisting of scrubbers, circulation tanks, and intermittent stills. At times, accident curtailed the still power, so that the oil was retained longer in circulation in the scrubbers, when its content of products rose, but owing to the shortage of stills the output fell. On these occasions the product, compared with normal, contained less benzene and an increased percentage of toluene; so that benzene was carried away and toluene retained.

When an inadequate flow of oil for complete recovery passed through two scrubbing units in series—the second bringing all the oil from the first into contact with richer gas—the oil leaving the second unit contained much less benzene than when entering, but more total products. Direct proof that benzene was carried away, and other products retained!

A rotary washer-scrubber, partly filled with oil, and to which no more was admitted while gas was passed constantly for a long period, showed, upon sludging-out, 15 per cent. of products in the oil; and from the known relationship between benzene, toluene, &c., under conditions of complete recovery, and the relationship found on analyses here, most of the benzene, and in this case some toluene, must have been carried away by the gas. It appears then probable that, as water is evaporated by a current of air, so the action of a stream of gas passing through oil saturated already with recovered products brings about an evaporation or vaporization of the products similar in effect to fractional distillation, the gas takes the place of heat. The oil having the greater affinity for toluene and xylene, &c., acts as the dephlegmator, so that the lower boiling point products pass forward and the higher ones are retained. The scientific mind must acknowledge the analogy between the two things, and cannot doubt the successful issue of the process.

After Dr. Davidson's discovery was made known, experiments with a rotary washer showed that, without adding benzol (of which there is a surplus in the gas), by correct limitation of the oil flow alone, most of the toluene, &c., can be retained in the oil, while most of the benzene is carried forward in the gas; and while the process was in operation the fall in calorific value in the gas, as shown upon a recording calorimeter, did not exceed 3 per cent. of the net value.

In reference to the use of tar with a similar object in view, coke-oven practice is absolutely unanimous in looking askance at any admixture of tar or tarry matter, other than creosote or heavy oil, in the absorbing medium. The "wash oil" is changed long before it approaches to the nature of tar, and many devices are employed to get rid of pitch. In cases creosote stills are put in, and used for no other purpose than to extract pitch constantly from the wash oil. When spent oil containing 20 to 25 per cent. of pitch is used in the same scrubbers and stills, the output falls 50 per cent. compared with normal conditions with pure oil.

During those long periods in the past when benzol, &c., recovery showed no profit, the idea of saving the cost of creosote oil by substituting tar was fully investigated by the writer. Under equal experimental conditions, tar, as an absorbent, was only 40 per cent. as efficient as creosote oil; and on account of its viscous nature in practical work, this cannot be realized. This lowered efficiency of tar requires, in compensation, more than a corresponding increase in scrubbing area, or, in the reverse aspect, any works using an apparatus to scrub the gas with tar would get three times the output of toluene by using creosote oil instead in the same apparatus.

It may be true that tar treated by gas with a time factor *ad lib.* is capable of absorbing much toluene; but it will be difficult to find any coke-oven expert in this country who would support the use of tar as an absorbing material under any conditions where creosote could equally be applied. Coke-oven experts have at times had actual experience of diluted tar which has forced this conclusion upon them. When, with oil containing 30 per cent. of pitch, the coke-oven chemist finds the saturation, which with good oil is $2\frac{1}{2}$ to 3 per cent., fall to under $1\frac{1}{2}$ per cent.; when his stills and heaters, in spite of pressing, cannot reach the required temperatures; and when his output drops to 50 per cent. or even less—anyone who suggested to him the use of tar as a scrubbing medium would meet with a cool reception.

Oil-Mixed Cement Concrete.

A bulletin of the United States Department of Agriculture, by Mr. L. W. Page (Director of the Office of Public Roads), states that, while experimenting in an attempt to develop a non-absorbent, resilient, and dustless road material, capable of withstanding the action of automobile traffic, the writer's investigations led him into a very promising discovery. He found that when a heavy mineral residual oil was mixed with portland cement paste it entirely disappeared in the mixture, and, furthermore, did not separate from the other ingredients after the cement had become hard. The possibilities of oil cement mixtures for waterproofing purposes were recognized; and extensive laboratory tests were immediately begun to determine the physical properties of concrete and mortar containing various quantities of oil admixtures. These tests have now extended over a period of considerably more than two years. Many valuable data have been obtained, through both laboratory and service tests, which demonstrate very definitely the worth of oil-mixed concrete in damp-proof and waterproof structures. It has been shown that the admixture of oil is not detrimental to the tensile strength of mortar composed of 1 part cement and 3 parts sand, when the oil added does not exceed 10 per cent. of the weight of the cement used. The compressive strength of mortar and of concrete suffers slightly with the addition of oil, though when not exceeding 10 per cent. of oil is added, the decrease in strength is not serious. Concrete mixed with oil requires a period of time from 50 to 100 per cent. longer to set hard than does plain concrete; but the increase in strength is nearly as rapid in the oil-mixed material as in the plain concrete.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

ANNUAL MEETING IN EDINBURGH, FRIDAY, SEPT. 3.

PRESIDENT: MR. J. B. SCOTT, OF COWDENBEATH.

The Fifty-Fourth Annual Meeting of the North British Association of Gas Managers was held on Friday last in the Freemasons' Hall, George Street, Edinburgh. The attendance numbered about ninety. Mr. J. B. Scott, of Cowdenbeath, the President of the Association, occupied the chair. He was supported by members of the Council and by Messrs. James Hutton (the Chairman) and John Bennett (a Director), representing the Cowdenbeath Gas Company.

Introductory.

The President said he was pleased to see such a large turnout at the opening of the proceedings; and he hoped as the day wore on the attendance would be even greater. He did not think those present would regret the decision of the Council in asking them to come to Edinburgh for the meeting. The beautiful hall in which they had assembled was alone worth coming to see; and further they seemed likely to enjoy Edinburgh under the most pleasant conditions, as the weather gave promise of being on its best behaviour.

Welcome from the Cowdenbeath Gas Company.

Mr. James Hutton, who was cordially received, said that on behalf of the Directors of the Cowdenbeath Gas Company, he had pleasure in welcoming the members of the Association to Edinburgh. He agreed with the President in saying that the decision of the Council to hold the meeting in Edinburgh was, on the whole, a wise one. Some of them certainly would have liked to have had the meeting in Cowdenbeath, seeing that Mr. Scott's life-work had been successfully carried on there; but, unfortunately, Cowdenbeath was not altogether suitable for a meeting of this kind—not central and convenient as Edinburgh admittedly was. It gave the Directors of the Cowdenbeath Gas Company real pleasure to observe that the Association had appointed their Engineer and Manager, Mr. J. B. Scott, to be the President for this year. In the years that were past, they, in Cowdenbeath, had recognized Mr. Scott's worth; and it gave them undoubted satisfaction to note that Mr. Scott's professional colleagues throughout Scotland considered him worthy to fill the presidential chair of this old Association. He (Mr. Hutton) was certain their President would discharge the duties of his office in the same satisfactory and efficient manner as he performed the work entrusted to him by the Company with which he was connected. It would give the Directors of the Company much pleasure to meet the members of the Association and their lady friends at dinner in the North British Station Hotel later in the day. They would do what they could to make the function enjoyable. He trusted the meeting would be a successful one; and that the deliberations of the members would be profitable to all.

Mr. John Lang (Alexandria) called for a vote of thanks to the representatives from the directorate of the Cowdenbeath Gas Company who had attended that forenoon to extend a welcome to them. It was a pleasure to have both Mr. Hutton and Mr. Bennett present with them; and they hoped, if it fitted in with their arrangements, that they would remain for some time and take part in the discussions.

Annual Report of the Council and the Accounts.

[See *ante*, p. 388.]

The President said the next business was the consideration of the annual report of the Council and the accounts. So far as the membership of the Association was concerned, he might say that the figures disclosed a decrease of one; but he believed this would be more than made good as the result of the meeting that day. There were still a great many gas managers throughout Scotland who remained outside the membership of the Association; and this point had been fully considered by the Council, who felt strongly that something required to be done. It would be to the benefit of the Association, and add materially to its strength, if the managers to whom he had referred could be induced to join. It would be observed that the Commercial Sections connected with the Association continued to do good work; and it was to be hoped they would extend their usefulness. From the report it would be noted that there was to be no "William Young Memorial Lecture" this year. The Council thought that, in the circumstances in which they were placed, it would be advisable to leave this feature out of the programme. For one thing it would allow their funds to accumulate a little; and, besides, as another reason, it was felt there might be a difficulty in securing a lecturer under existing circumstances. So far as the accounts were concerned, he thought they had every reason to feel gratified with the figures. The General Fund had been somewhat depleted by the grant of £50 made last year to the National Relief Fund. It remained in a healthy condition; and he was sure they were all pleased at the substantial grant they made to the war relief funds last year. During the past year, two claims had been made on the Benevolent Fund; and in this connection he felt called upon to remark that it was a satisfaction to them all to know that such a fund was at their disposal if necessity arose. On the whole, he had the utmost pleasure in moving the adoption of the report and the accounts.

Mr. A. Smith (Glasgow), in seconding, remarked that the General Account seemed quite satisfactory; but he felt that the printing and stationery item was very high.

The President admitted that the printing account was somewhat high; but there were satisfactory reasons for it. There had been a change in the secretaryship, and that had involved new stationery, &c. Again, the cost had gone up because of the number of circulars which had been sent out to members of the Association as a result of the war. One other reason for the additional expense was due to a change of printers—an alteration which the Council felt it necessary to make. For the first year after the change there was bound to be an increase in the matter of cost; but by another year he anticipated that there would be a considerable reduction in the charges.

The report and accounts were then unanimously approved of.

Apologies for Absence.

The Secretary and Treasurer (Mr. Peter B. Watson), having intimated a number of apologies for absence, said it was a gratification to the Council to observe at the meeting one or two visitors from the South, to whom they extended a kindly welcome. He had no doubt they would have had many more visitors from the other side of the Tweed had it not been for the present some what stressful days. As things were at present it was practically impossible for a gas manager, on the East Coast at any rate, to get away from his own town; and but for this circumstance he (the Secretary) felt that many friends from the other side of the Border would have been with them.

The President then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—We meet to-day under circumstances unparalleled in the annals of history; and I hope you will pardon me if I make a slight digression for a moment from the usual topics generally dealt with in a Presidential Address.

THE EUROPEAN WAR.

I cannot refrain from making reference at the outset to this terrible European war. Millions of men, grim, stern, and dour, are facing each other in the greatest combat the world has ever seen. We have been compelled to turn the homes of our peaceful industries into shell and munition factories; our craftsmen's skill is being employed to devise and construct machines of death and destruction; the wealth of our nation is being drawn upon in a manner undreamt of; and the whole resources of our Empire are being utilized, must be utilized, to take part in this terrible Armageddon. The Kaiser and his Huns, the pirates, and murderers must go under. Our word of honour to Belgium, our duty to our Allies, our own freedom—aye, our very existence—demands that we must fight to the bitter end; and for this the finest manhood of our country and our Colonies have gone forth to join hands with our brave Allies to do battle against the tyrant foe. At the moment, I can think of no words more appropriate to the voluntary actions of these brave fellows than those of our own National Bard, as he applied them to Auld Scotland in one of his famous poems:

> "Auld Scotland has a raucle tongue,
> She's just a devil wi' a rung,
> An' if she promise auld or young,
> To tak' their pairt,
> Tho' by the neck she should be strung,
> She'll no desert."

And thank God this is the spirit of the Empire! Then let this spirit of protection and our love of honour and freedom be an inspiration to us to go on doing our "bit," whatever it may be, and in the end victory will be the reward.

PERSONAL.

At the last annual meeting of the Association you conferred on me the high honour of President, and I can assure you I appreciate it. Many interesting and important subjects have been brought before the Council during the year, and they, at all times, have given their full support and attendance, which made the work very much easier for me.

The Council have decided to do honour to-day to a worthy member and colleague, Mr. G. R. Hislop, of Paisley, and later we are to have an interesting little ceremony in connection with this matter. It was also decided to leave out the usual "William

Young Memorial Lecture" this year; but I have been fortunate in securing four gentlemen to come forward with papers, which I trust will prove of interest, and bring out good discussions.

A RED CROSS GIFT.

In addition to the sum voted at our last annual meeting towards the National Relief Fund, the Council have decided to make an effort to raise a sum sufficient to provide an ambulance waggon to be presented to the Scottish branch of the British Red Cross Society for use at the front. The sum required is £450, and a circular has been issued to all members of the Association soliciting subscriptions; and we suggest that the circular might be submitted to Committees, Boards of Directors, and the trading firms who are represented in our Association by extraordinary members, so that all who care may have the opportunity of helping in this most deserving object. If we are successful—as I am confident we will—the waggon will be presented as from the North British Association of Gas Managers, and will bear that name.

OBITUARY.

I would like in a word to refer to the lamented death of our esteemed colleague and friend, the late Mr. William Blair, of Helensburgh. Mr. Blair, who was President of the Association in 1908, was a man of sterling worth, a true typical Scotsman, quite as much at home in England and Ireland as he was in Scotland. He was well-known in all three countries, and in all was equally beloved and respected. He was a born gas engineer, doing good work all his life, and could claim to be the pioneer of vertical retorts in Scotland. He had just finished his fine installation at Helensburgh, and was enjoying the fruits of his labours when he was cut off.

The death of still another Past-President has to be recorded—Mr. Lighbody, of Renfrew. He occupied the chair in 1903, but owing to his long protracted illness, he has not been much among us since. Although not so widely known as Mr. Blair, he, too, did good work in his own sphere.

Then the gas industry has lost a faithful friend and worker in the late Mr. Edward Allen, of Liverpool. Much has already been said about Mr. Allen's life-work; but I must take this opportunity of placing on record the Association's high appreciation of the valuable services he has rendered to the industry he loved so well. He has often been at our meetings, and always took great interest in the welfare of the Association, especially when acting as President of the Institution of Gas Engineers; and there is nothing surer than that we have lost, prematurely, one of the most outstanding men of our profession.

THE TECHNICAL PRESS.

I do not think there is another industry so well supplied with technical journals as we are; and I might corroborate the words of one of our Past Presidents by saying, "They are second to none." Weekly they lay before us the best information available of every description relative to our own particular sphere, and they are a store of knowledge to every gas engineer and manager. Neither do they hesitate to strike out on behalf of any member of our profession if occasion arises; and their timely hints and advice are much appreciated.

Yet were you to ask me to-day if I had any fault to find with them I would at once say, Yes; and it is this: When one finds himself in the position I am in at present, he discovers that everything he would like to say has been said already, every subject he would like to deal with has been so ably dealt with already, or possibly I should put it this way—that he agrees so well with what has been said that he is left with nothing to add. That, then, is something like my position, gentlemen; and if I am compelled to go over old ground, please blame the journals for being there before me.

A RETROSPECT.

Looking back over the past twelve months, we must come to the conclusion that it has been a most eventful time—I make bold to say the most eventful ever experienced in the history of our industry. First came the great shortage of coal, caused partly by the wholesale enlistments of the coal miners and partly by the railways being monopolized for the moving of troops and transports. Coalmasters, in many cases, failed to implement their contracts, with the result that stocks of coal had to be seriously drawn upon, and many undertakings had to purchase at increased prices. The freight of seaborne coal rose to alarming figures, as also did all materials necessary for the carrying on of our usual business. Increased taxation, the introduction of bonuses, together with allowances made to soldiers' wives and families, all went to reduce our balances, and in some cases to bring about deficits.

Our staffs were gradually being reduced through enlistments, and with a few exceptions the sales of gas had declined through restricted public lighting and other economical reasons. The climax, however, was reached when we came to renew our contracts. Coal was being quoted at abnormal prices, and offers for tar products had fallen to little more than half their former rates; in fact, everything had got to such a position that there could only be one solution—viz., a general rise in the price of gas. This was a staggering blow to the gas consumers. In past years, they have been more accustomed to having reductions, and this fact no doubt made the increase of price more acutely felt.

So far as the coal supply was concerned, immediate action was absolutely necessary, not so much regarding the price, but to safeguard a supply for the coming winter, which was of more importance. For this purpose, a national conference of about six hundred representatives of the gas and electricity undertakings was held on the 6th of May last to consider the whole situation. From this conference a large and representative deputation was selected, who, in turn, got into touch with members of Parliament, and were successful in getting them interested in the matter. These members made representations to the Government, who very soon realized the serious position of the coal trade, and the immediate outcome was the prohibition of shipment to all neutral countries, unless under a licence. This had the effect of stopping a good deal of shipping, and the result, of course, was a more plentiful supply at home, and the abnormal prices ruling at the time immediately began to fall. Since then, the Government has taken a firmer grip, and now all coal shipped, either to our Allies or to neutrals, must be sanctioned by licence.

PRICE OF COAL (LIMITATION) ACT.

Following this, the President of the Board of Trade introduced the Price of Coal (Limitation) Bill, and, at the time of writing, it has just come into operation. It is rather difficult to say, at the moment, what the ultimate result of the Act will be; but I do not think it will lower prices to the extent a first glance would lead one to expect; in fact, I am inclined to think that the prohibition of the wholesale shipment is of far more importance to home industry than the passing of the Price of Coal (Limitation) Act.

The first clause stipulates the conditions of sale; and I would particularly draw your attention to the words "coal of the same description, sold in similar quantities, and under similar conditions . . . " on the corresponding date in the twelve months ending June 30, 1914. According to one reading of this clause, it means that if I were to make a contract to-day, I would have to go back to Sept. 3, 1913, to find the price then, and add 4s. (or the standard amount) to that price.

Let me give you my own case then. In April and May last I took in quotations for coal, and the increase of price ranged from 8s. 6d. to 10s. per ton over last year's prices. I bought a small quantity at this high figure. But, later, when the Government took hold of the shipment, the prices immediately came down; and since then I have been buying from week to week at an average of 5s. increase over last year's prices, or 16s. per ton. Suppose I make a contract now under the new Act, I may have to go back to September, 1913, and there I find my price was 13s., and this *plus* the 4s. allowed by the Act brings up my price to-day to 17s., or 1s. per ton more than I have been paying all the summer. There is not much advantage there, is there?

The second clause says: "The standard amount shall be 4s." The fixing of a maximum price really fixes a minimum, and the chances of making a deal are no longer existing. The coalowners have been twitted with taking the Act lying down; but I think they have been wise. They can see quite a good time in front; and best of all, they are now protected by Act of Parliament, so long as the war lasts and six months after.

Then the amendment which was added during its progress no doubt will relieve a little those statutory undertakings that contracted in May last at very high prices. But it is of no use to the Scottish gas companies, who are practically all non-statutory. It is difficult to see why non-statutory gas companies should not get the same advantages as statutory companies in a matter of this kind, because they are equally supplying a public necessity. It may be our own fault that we are not statutory gas companies, but the result is that those who bought their coal at high prices are compelled to keep up the price of gas accordingly, while the corporations and statutory companies can claim relief, and thereby reduce their price correspondingly, so that it produces, in my opinion at least, a favourable position to statutory company and corporation undertakings.

Frankly, I am not enamoured of the Act, and I may be throwing myself open to a good deal of criticism by thus stating my opinion. But nevertheless it is candid, and represents my views at present. I consider our position would have been amply secured by the Government keeping a tight hold of the shipment of coal, and leaving us to make our own bargains. I do not know how it is going to affect English gas-works, but those of us in Scotland will not gain much, if anything.

ENLISTMENT OF EMPLOYEES.

The further enlistment of gas employees is giving a considerable amount of worry to many gas managers at the present moment. While we may wish to do our best to assist the War Office authorities by allowing our men to go, there is a limit to our resources, and we have a public duty to perform in keeping our individual districts supplied with gas, &c. Not only so; but as the President of the Institution of Gas Engineers so ably put it at the last meeting, it is perhaps only now that so many realize the important part that the gas industry is playing in the welfare of the nation, by providing dyes, disinfectants, drugs, high explosives, &c., and gaseous fuel for the manufacture of all classes of war material. I am sure we are all proud of the usefulness of our industry; but if we are to maintain it, we must be left with sufficient men to carry on the work successfully.

The obtaining of war badges for our employees was raised with the War Office; but this they refused. Later, however, as you will all have noticed from the information published in the Technical Press, they stated that no objections would be raised to the wearing of a public service badge.

This badge was intended to prevent our men being accosted on the streets. But, of course, it did not keep them from enlisting if they wanted to; so that something more definite was required. We are much indebted to Mr. Walter T. Dunn for the persistent way he has kept at the War Office officials; and now we know that instructions have been issued to Recruiting Officers to the effect: "That on no account should skilled employees of gas-works be accepted for enlistment, unless they are in possession of a certificate from their employers that their services can be spared." This is so far satisfactory; but one day lately I had a visit of two officers at our works, and the question of what constituted "skilled" employees was raised. They argued that stokers did not come under the category of skilled employees. I wrote Mr. Dunn on the point, and he replied stating that stokers, especially machine men, in his opinion, were skilled employees, and I presume we may take this as being the case.

Regarding the enrolment of munition workers, the position is "that an opportunity will be given to the employer to state, for the consideration of the Minister of Munitions, that the man is engaged on Government or other essential work," &c. I think the latter reason quite covers the case of gas employees.

As to what has actually taken place in the way of enlistment during the past twelve months, I thought it would be interesting and useful if I were able to state in a reliable way the total number of Scottish gas employees enlisted, &c., so I issued a circular to all the works in Scotland asking the information. I sent out 255 circulars in all, and received 203 replies. Only 25 works of importance failed to reply; the others being small works with only one or two employees. From these I have compiled the following figures:—

Total number of employees when war commenced . .	6865
Number enlisted since	1366
Number gone to munition work	45
Number replaced by other workers	1204
Number short of usual staff	207

The last question is perhaps analogous, or at least misleading, as the fourth question really gives the figures required. If we deduct the number of replacements from the number gone, then we get the shortage.

The spirit of patriotism among the original gas employees stands out very clearly; the proportions of men enlisting being practically 20 per cent. On the other hand, a large proportion of them have been replaced, and the actual shortage is not so large as we might have anticipated. But it must be borne in mind that many of the men who have replaced the originals must be much less efficient, as in many cases they will be men over military age, and not nearly so fit for the strenuous labour of a gas-works.

Taking into account, also, the great difficulty that will now be experienced in obtaining our extra winter men, I think we are bound to use our united efforts with the war and munition offices to get them to stop entirely the enlistment of our employees, or otherwise to enrol the whole as munition or "other essential workers," so that our staffs may be safeguarded. At the same time, I am willing to accept the doctrine that every economy should be effected in the manufacture and use of gas. The absence of crime in our large cities where public lighting has been enormously reduced shows that the extension of the practice might be safely adopted in every community during the period of the war. Further and other economies might well be introduced; and at a crisis like this, when every penny must be saved, I see no reason why in large cities common stairs and back courts should be lighted all night. The earlier closing of public houses and clubs points to the stair gas being put out earlier—at latest at midnight. Public and private economy is needed to the extent of every farthing; and I do not think I am false to the best interests of our trade when I preach it in the national interest.

COMMERCIAL SECTIONS AND RESIDUALS.

Residual products are playing no small part in the welfare of our revenue accounts; and I am sure we all agree that the Commercial Sections have done much good work in this as well as in other directions. Matters of varying interests can be discussed at these meetings in a free and easy manner, knowing as we do that no shorthand report is being taken, and that no minutes of the meeting will ever give a verbatim report of the proceedings. Sometimes we hear complaints that the ideals set forth are not being walked up to; but after all humanity is not perfection, and something at least is being accomplished if we are making things a little better than they were. It is a pity, however, to find that the total membership of the Commercial Sections is only 76 out of 160 members of the Association; but I have an idea that if some gas authorities would give their managers a little more encouragement and freedom to attend the meetings, we would have more members, and better attendances. If they do not, they lose money.

The Commercial Sections are justifying their existence in spite of anything that may be said to the contrary. If you remember, two years ago stocks of coke were gradually increasing, and by the spring of 1914 they had risen to almost alarming proportions. Had it not been for the timely discussions at the Commercial Section meetings at that time, I have little doubt but there would have been some serious under-cutting of prices going on. Much can be done by each individual member in his own district, by pushing the sales of coke for various purposes; and when a new customer is secured, he knows that he has the protection of the Commercial Section in retaining that customer.

SULPHATE OF AMMONIA.

We are to have a paper from a representative of the Sulphate of Ammonia Association, which, after all, is just a Commercial Association. I have no doubt what he has to say will prove interesting, even to those who do not make sulphate, because the selling price of sulphate regulates the price of ammoniacal liquor. Sulphate of ammonia can now be manufactured with advantage in very moderate sized works, and in the country towns the local demand generally equals the supply, so that most of us can sell our whole output locally. Whether we sell locally or for export, it is strongly recommended by the Sulphate of Ammonia Association to produce the best possible quality, so that we may satisfy our home consumers, and be more able to meet foreign competition. Nothing less than 25 per cent. ammonia is asked for, with as low a percentage of moisture and free acid as possible.

TAR WASHING OF GAS.

The market value of tar has suffered severely through the war, and here we stand to lose in the meantime. The recovery of light oils by washing the gas with tar has proved an interesting subject; and it would seem that quite a new phase has opened out before us. The demand for more of these oils has been the means of inaugurating a process into gas manufacture little dreamed of before by gas managers, and even yet some look at it askance. The pumping of tar through the scrubbers and washers goes distinctly against the old order of things. Yet, there it is in full swing every day and nothing serious has happened; and one outstanding feature is the fact that it is quite applicable to large and small works alike. We are all acquainted with the origin of the process, and it now lies with each individual manager to adopt it. In most cases it is only yet in the experimental stage; still some good results have been obtained. I have had some experience in the matter, and have come to the conclusion that a tower scrubber is the best and most convenient apparatus for tar washing. It is possible to get a better contact in a tower scrubber than in most of the other plants, though a Holmes scrubber also does very well.

I have been tar-washing the whole of our gas since the end of April, and I have been able to increase the light oil content to six times the original amount. I have experienced no ill-effects yet, and the only oncost to be reckoned with is the running of the pump and general supervision. I do not think, however, we are being fairly remunerated; but that this will be looked into in due course, I have no doubt.

There is one point in connection with this process that I want especially to bring before you; and it is this. To the ordinary gas manager of medium and small sized works, the results he obtains are a sort of mystery to him. I mean by that, he has no laboratory at his disposal to make tests, and how can he know, when it comes to selling his article, whether he is getting value? To him the tar is just the same black tar—possibly a little thinner. Meantime arrangements have been made, whereby Dr. Grey, of the Royal Technical College, Glasgow, will make analyses of any samples sent in to him; but I cannot see that this will go on for an indefinite period.

A SUGGESTION.

Now, gentlemen, I have a suggestion to make—one that occurred to me while writing this address; and I give it to you for what it is worth. We have a Research Fund, which has done little or nothing in research work all its life; and I suggest that we should endeavour to make it a real live fund, and with it constitute and equip a central laboratory in (say) Edinburgh or Glasgow, with a qualified chemist in charge.

This would be of some service to the gas industry of Scotland. We could go there for all sorts of information. Managers could take samples of anything they desired to test; and with the assistance, or permission, of the chemist in charge, they could make the tests themselves. We would then be able to get the mysteries of our doings laid bare to us, and not only so, but we would know when we were getting a fair price for the many articles we sell. A small Committee could be drawn from the Association to take supreme charge of the place.

This is not something for nothing, and funds would have to be raised annually to meet the expenses. But surely enough could be raised from the Scottish gas industry to do this much. If it pays a large works to maintain a laboratory and chemist, it will surely pay a combination of smaller works to do likewise. Possibly the Council will consider the matter.

THE ALLIED TRADES.

In a word, I would like to refer to the good work done by our constructional, gas heating, cooking, and lighting engineers. The gas plant and meter makers of Great Britain can take their stand anywhere; the gas-cookers, gas-fires, water-heaters, &c., that are now being put upon the market are a credit to the technicians and the draughtsmen who design them. I sometimes wonder if we realize how much easier our labour is being made by the ever-improving class of goods we now have to deal with in all departments; and what is better, it is in every case, so far as I know at present, "All British."

The same can scarcely be said of gas lighting. For some years past there has been a cheap inferior class of fittings dumped on the British markets; and I am greatly afraid some of us have been too ready to take up this line simply because the price made it popular. The British lamp and incandescent burner is a substantial article and gives the best results, and it is now for the

British firms to see to it that the opportunity is seized to take up the whole supply of fittings, burners, mantles, and also the glass. Let us have done with the "Made in Germany," "Made in Austria" brand, and have the good old hall-mark of "All British."

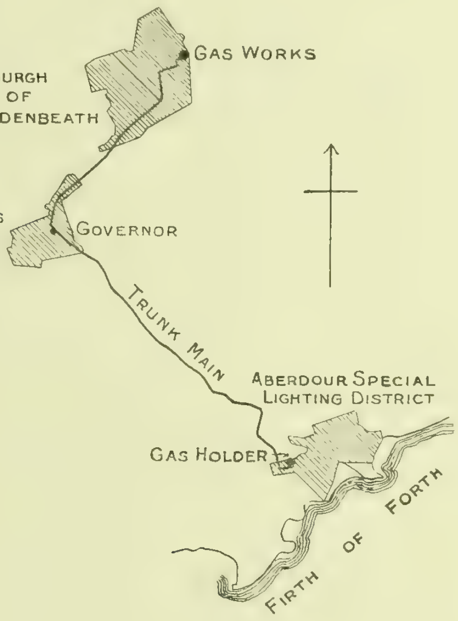
COWDENBEATH GAS.

I do not want to introduce much of the Cowdenbeath element into this address, yet it might appear strange were I to ignore it altogether.

Had Cowdenbeath been a suitable place to hold this meeting, I am sure my Directors would have been delighted to see you there; but being, as it is, a busy little mining burgh, situated right in the centre of the Fife coal fields, I have no doubt you will feel happier away from it. This, however, is not my feeling. I like Cowdenbeath and its people; and if the town is not the picturesque place we would wish, we have only to walk a few miles to reach Aberdour and the beautiful shores of the Forth. Aberdour was the latest addition to our district of supply; and I can assure you it makes a pleasant change to leave the coal pits, with all their disturbing elements, at the one end of the main pipe, and walk along to a trig little summer resort at the other.

We have no real outstanding feature at the Cowdenbeath Gas-Works at present either in manufacture or supply. We conduct our business pretty much on the same lines as other modern concerns. We still cling to horizontal retorts; the labour being made much lighter than usual by the aid of a good coal and coke handling plant. We have good washing and scrubbing apparatus, and manufacture sulphate of ammonia. I have not seen the inside of a purifier for two years. Our employees are all of the long-service order; and thus we glide along very smoothly indeed.

In distribution we sometimes have a difficulty with our mains and services; but that is to be expected, and careful vigilance is the only cure. We have a high-pressure main which runs right through our area and delivers into a district holder at Aberdour, supplying the Crossgates and Fordell districts in passing, and many other country consumers.



Cowdenbeath Gas Area.

We have our area divided into three separate districts, and each district is attended to by its own superintendent, who resides within his own boundary, so that he may be within the call of the consumers, night or day. We have a gas-office and show-room in each district; and these we find to be of great advantage.

We have been passing through rather stirring times lately. The Company decided to promote a Provisional Order. This was an old idea that had often been discussed by the Directors, so that they might secure their rights of supply throughout the whole area, and at the same time place themselves under the usual statutory obligations, &c. And it became acute when the Directors were considering the necessity of raising more capital to enable them to go to Aberdour. But you may judge of our surprise when we learned that the Town Council at Cowdenbeath had carried a motion deciding to adopt the Burghs Gas Supply (Scotland) Act, 1876, and purchase the undertaking of the Company.

This was rather upsetting; but it did not deter the Company proceeding with their Order. It was duly advertised in November of last year; while almost at the same time the Town Council advertised the adoption of the Burghs Gas Supply Act. No overtures were suggested by either side, and both schemes went forward. A petition signed by the necessary number of ratepayers was lodged against the Town Council adopting the Gas Act; and this necessitated the taking of a poll of the ratepayers. It was here the first serious difficulty cropped up.

The Gas Company were advised that the method of taking the poll of ratepayers under the 1876 Act was a vexed question in legal circles. Opinions had been got from eminent lawyers in the past—such as the late Mr. J. B. Balfour (afterwards Lord Kinross) and Mr. Alexander Ure (now Lord Strathclyde)—that the proper method of taking a poll of the ratepayers under the Gas Supply Act of 1876 was to be found in the older Burgh Police Acts. On the other hand, it was maintained that the modern method of taking a poll of the ratepayers applied. There is no doubt that in this matter there was a legislative overlook; and the importance of the question is seen when one realizes that if anyone at some later date contended that the adoption of the Burghs Gas Supply Act had not been properly gone about, the whole later transactions relating to the purchase of the Company and the issue of bonds, &c., to pay the price might be reduced as invalid. In these circumstances, my Company presented a petition to the Lord Ordinary to interdict the Provost of Cowdenbeath taking the poll in the method he proposed, and also to interdict the Sheriff of the County of Fife from registering the result of the poll. Within twenty-four hours of the presentation of the petition, the Lord Ordinary heard parties and refused interim interdict. The poll was accordingly taken; and in ordinary course the action should then have gone into the Outer House of the Court of Session to enable a record to be made up and the case properly argued. My Directors were, however, advised that the merits of the case might quite well be disposed of upon the question of an interim interdict, and they accordingly lodged an appeal to the Inner House against the Lord Ordinary's Interlocutor. At the hearing, to avoid complications with the Sheriff, the Town Council of Cowdenbeath agreed that they would not lodge an application to the Sheriff to register the result of the poll until the case had been disposed of in the Inner House. After a learned argument before the Inner House, the First Division, consisting of Lord President Strathclyde, Lord Skerrington, and Lord Johnston, held that the law was that the poll should be taken according to the modern method; so that what was a vexed question for many years in connection with these matters has now been cleared up. I may also say that the solution to this difficult question was got at a minimum of expense. The petition for interim interdict was presented to the Lord Ordinary on Jan. 20, 1915, and the appeal to the Inner House was heard and disposed of on Jan. 26, 1915—that is to say, an authoritative pinion was got upon this important question within a period of six days.

As was to be expected, the poll of the ratepayers went in favour of the Town Council, and accordingly the Town Council are now armed with all the powers of the Burghs Gas Supply Act of 1876. The Town Council immediately gave us notice that they were willing to treat for the purchase of the whole undertaking, including the portion of the undertaking supplying the special lighting districts of Crossgates and Aberdour, outside the burgh. This offer was accepted by the Company; and accordingly the proceedings for the Provisional Order were dropped.

From an academic point of view, it was a pity the Company dropped the application for their Order, because another very nice question arose, which would have had to be solved somehow. As I have mentioned, we supply not only the Burgh of Cowdenbeath, but a large part of the area administered by the Dunfermline District Committee of the County Council of Fife, and of the area administered by the Kirkcaldy District Committee of the County Council of Fife. In the Dunfermline District Committee area there are the special lighting districts of Crossgates and Aberdour, and each of these special lighting districts, or both of them, might have adopted the Burghs Gas Supply Act of 1876, whereupon each of them, and also the Burgh of Cowdenbeath, would have been in the position to serve us with notice that they were willing to treat for the purchase of the whole undertaking. Obviously some legislative solution would have been required for the difficulty; and it seems to me that if the Company had persisted in their application for a Provisional Order giving them statutory powers for the whole area, they would have had a very good chance of getting it, if for no other reason than that it was the best possible means of reconciling the rival interests of the County and the Burgh authorities.

Apart from the legal difficulties that would have been solved by the Company getting statutory powers from Parliament to supply gas within the whole of their area, I think it would have been in the public interest to have put the whole area upon an equal footing under a body which would be subject to parliamentary control regarding capital dividend and price of gas. In the meantime, no further progress has been made, because possibly the Cowdenbeath Town Council will have been informed of the Treasury restrictions upon raising capital for new undertakings. It seems to me, however, that in these proceedings there is an object-lesson for other Scottish non-statutory gas companies. I think that non-statutory gas companies in Scotland have been very foolish in not applying for statutory powers. I think that a statutory gas company offers an excellent solution to the question of how best to reconcile private enterprise with public interest. If Scottish gas companies would go in for statutory protection, there would be no need to municipalize the gas undertakings.

IN CONCLUSION.

I think our Association is managing very well to carry out the work it set out to do fifty-four years ago, and, together with the assistance of the Commercial Sections, the British Commercial Gas Association, &c., I think there is every hope that it will go on increasing in power and usefulness. The Junior Associations are also doing good work; and we hope they will continue to do so, as they in turn will some day be the Seniors. Possibly, we could help the Juniors a good deal by arranging to let them away to attend meetings, &c.

I do not think we have anything to fear in the future. Given a fair supply of coal and labour, we will surely pull through. We are no doubt up against difficulties, and may get some hard knocks, but I have every confidence in the good old ship "Gas" surmounting all the storms. If we do get a little depressed, or feel the strain a bit heavy, let us remember the brave lads out there, on land and sea, so nobly doing their duty for us; then let us do our duty for them.

At the conclusion of the address,

Mr. A. Masterton (Edinburgh) proposed a vote of thanks to the President for the excellent and interesting address to which they had listened with much edification. He felt it would be their own fault if they had not derived considerable benefit from it, because they could all readily understand the amount of attention, study, and deliberation which Mr. Scott had bestowed upon such an extensive survey of matters connected with the gas industry. There was some difficulty in putting into lucid and suitable form one's ideas on the various topics of interest and attractiveness to those engaged in the gas profession; and, likewise, it was not easy to find new subjects upon which to descant. Indeed, the latter difficulty at times necessitated the ringing of the changes upon old themes. The President, however, had been most successful in supplying them with much food for thought, consideration, and study. Without eulogizing further he would, in the name of the Association, thank Mr. Scott for his presidential address and at the same time congratulate him upon his praiseworthy and meritorious efforts.

The motion was carried amid loud applause.

The President, in acknowledging the vote, remarked that if his address proved of the least interest to any of them, he would feel amply repaid for the labour he had expended.

Proposed Red Cross Ambulance Waggon.

The President said he had a most gratifying intimation to make—namely, that the total amount of subscriptions received for the proposed ambulance waggon to be presented to the Scottish Section of the Red Cross Society on behalf of the Association was £92 18s. 9d. This sum had come to hand from 61 subscribers. In view of the progress which had been made, he sincerely hoped that the members of the Association would take the fullest advantage of the suggestion he had offered in the course of his presidential address and enlist the sympathy and support of their Boards of Directors and Committees. Left to themselves as individual subscribers, it was practically impossible that they could attain the sum aimed at—namely, £450. But if they secured donations through the agencies and channels he had already indicated, the amount they had in view could be realized. Only the previous day he had a telephone message from a gas manager in Fifeshire announcing that his company had agreed to give a donation of £5. If the scheme was taken up in this spirit, and with the same measure of generosity by gas companies generally, they would very speedily secure the sum they had in view. He appealed to the members, therefore, to make this a personal matter, and to do what they could with their Boards and Committees to influence subscriptions for what was, after all, a most laudable object.

[In connection with the above fund, it is interesting to note that Mr. Allan Hannah, of Denny, who is a Commandant of the Red Cross Society (Western District of Scotland) was present at the meeting, and arranged with the Edinburgh Association to have a thoroughly-equipped motor ambulance, which is proceeding to the front within the next few days, sent to the Freemasons' Hall, in George Street, for inspection by the members of the Association attending the meeting.]

The Late Mr. Adam MacPherson.

The President said the majority of those present would have noticed the announcement of the death of Mr. Adam MacPherson, late of Kirkcaldy. Mr. MacPherson was one of the oldest members of the gas profession in Scotland, and a well-known member of the Association. He was one of the old landmarks that had gone; and he (the President) felt sure the sympathy of the entire membership would be given to the sorrowing relatives in their sad bereavement.

A Quartette of Papers.

The four papers on the *agenda* were then read and discussed.

(1) "The Training and Education of Gas-Fitters," by Mr. R. W. Cowie, of Dalkeith.—*See p.* 518.

(2) "A Simple Pressure-Raising Device," by Mr. James J. Scott, of Lower Largo.—*See p.* 514.

(3) "Gas Measurement: Past, Present, and Future," by Mr. Wm. Gordon, of Edinburgh.—*See p.* 515.

(4) "Sales of Sulphate of Ammonia at Home and Abroad," by Mr. F. C. O. Speyer, of London.—*See p.* 512.

Presentation to Mr. George R. Hislop.

The President said they had now reached probably the most interesting part of the day's proceedings—the presentation to Mr. George R. Hislop, of Paisley. Addressing the recipient, he said: On behalf of the Council and members of this Association, I have been asked to convey to you their hearty good wishes and congratulations on the occasion of your completing the long record of fifty years' service as Gas Engineer and Manager of the Paisley gas undertaking. We all felt, even in these distracting times of war, that we could not allow the opportunity to pass without in some small way showing our appreciation of the many great services you have rendered, not only to the town of Paisley, but also to this Association and to the gas industry generally. As colleagues, we are delighted to know that the Town Council and the inhabitants of Paisley, whom they represent, did not forget you in your year of Jubilee, and that they have shown their appreciation of the valuable services rendered to them. We have been blamed in Scotland for paying too much honour to the dead and too little to the living. If this is the case, then, in these days of great changes, let us change this also; for, after all, there is nothing gives a man more pleasure and more satisfaction than to be told that his work is recognized and appreciated. That, then, Sir, is what we wish to tell you to-day. You are possibly the oldest member of the Association, and hold the record of having been three times President. The part you have taken in the work of the Association is well known to all of the older members, and is stored up in our records of "Transactions" for the use of all who care to read. In your earlier days you had the companionship of many famous men. Possibly the greatest of these was the late William Young, of Priorsford; and it must be a pleasure to you to look back and think of the many discussions and arguments that took place in these former days. Your name has been made famous throughout the length and breadth of the land by your good works and the many inventions you have put at the disposal of all—not the least of these being your well-known regenerators. It would be difficult indeed to find another gas engineer to-day with a record such as yours. At the early age of thirteen years you, along with your brother, were appointed Joint Gas Managers of the Lanark Gas-Works; and later you held the position of Manager of the Falkirk and Coatbridge Gas-Works. Then a lucky day dawned for Paisley, when they, in their wisdom, selected you to take up the responsible position of Engineer and Manager of their undertaking. That was in 1865—a date preceding many of our births; so that I think you may be rightly proclaimed the Father of our Association and of the Scottish gas industry. At that time the make of gas at Paisley was something like 80 million cubic feet. To-day it is over 519 million cubic feet; while the price has been reduced from 4s. 2d. per 1000 cubic feet to 2s. 1½d. These figures tell their own tale—that of hard work and capable management. One could dwell long enough recounting the many important works that you have engineered and carried through, but time will not permit me to do so; and, as I have already said, "Who is there among us who does not know 'Hislop of Paisley'"? We would especially like to congratulate you to-day on being still hale and hearty, and able to take your place at our annual meeting, and to still go on with your good work in spite of your advanced years. It is a matter of great satisfaction to us, and I am sure still more so to your own family, to see you enjoying such good health and privileges; and I can assure you it is our sincere wish that you may be long spared to go in and out among us. Believe me when I say that there will always be room for you at the top table of our Association. [Loud applause.]

The President then asked Mr. Hislop's acceptance of a chastely-designed illuminated address. It was designed by Messrs. Gilmour and Dean, of Glasgow, is a beautiful work of art, and reads:

> To George R. Hislop, Esq., Gas Engineer, Corporation Gas-Works, Paisley.—We, the President, Council, and Members of the North British Association of Gas Engineers, desire to take this opportunity of offering you our sincere good wishes and to congratulate you on your completion of fifty years' service as Engineer and Manager of the Paisley gas undertaking.
>
> We also congratulate you on having the honour of being three times President of this Association, and we desire to thank you for the keen interest you have at all times taken in its useful work and welfare.
>
> We acknowledge the great skill and ingenuity you have always displayed in carrying out inventions and improvements for the manufacture and distribution of gas, and we likewise realize our deep indebtedness to you for the valuable services you have rendered to the gas industry.
>
> Our earnest prayer is that you may be long spared to your family and to us, and that your days may be filled with honour, love, and many friends.
>
> Signed on behalf of the subscribers,
>
> Alexander Masterton,
> John Lang,
> Robert W. Currie,
> Robert Muir,
> C. P. Myers,
> David Robertson,
> Wm. Wilson,
> James M'Leod,
> David Vass,
> L. Hislop,
>
> J. B. Scott, President.
> Peter B. Watson, Secretary and Treasurer.

Mr. George R. Hislop, who was received with acclamation, said he had to salute them all as comrades of the "Light Brigade." He greatly appreciated their kindness in presenting him with the magnificent testimonial. He had not the slightest idea when he was presented with similar tokens of goodwill a few weeks ago in Paisley that he would so soon afterwards be invited to this meeting to be the recipient of still another gift. Frankly, he could not tell them how highly he appreciated their kindness. It was a most interesting reminder. It carried him back to the times that were gone, and to some of the meetings and discussions which they had in those earlier days. He thought they ought all to feel proud of their profession, for it had attained a position in this country which few industries could boast of. They were struck with the dignity of their profession when they reflected upon its great indispensability in the industrial and social life of the world. The importance of the industry carried with it a corresponding responsibility on those who were associated with it in the public service. At times he looked back somewhat regretfully on the days that were past, and recalled the many old friends who took a lively interest in the Association. He was glad to think, however, that, while a new generation had arisen, it still remembered Joseph. His experience of gas management went back for something like 66 years; and, as one who could speak among them with almost parental authority, he would express the hope that those belonging to this new generation might have health and happiness in the various capacities in which they were employed. His desire was that the young men of the profession would come forward with their papers as in the olden days, so that the world might know that in the gas industry there were to be found men of skill, capacity, administrative ability, and who were altogether well qualified to discharge the many duties that devolved on them. At present they were living in a time of war, which had seriously disturbed both the social and the industrial life of the country. The gas industry had been no exception in the industrial disturbance, because the shortness of coal supplies, strikes, and threatened strikes had been a source of considerable concern to them all. If, however, they set themselves calmly and fearlessly to fight their commercial battles as their soldiers, sailors, and aviators were fighting the greater battles, they were certain to have victory, for he truly believed that God was with them. In conclusion, he thanked them all most sincerely for this tangible token of their goodwill and esteem.

Election of Office-Bearers.

It was announced that the ballot for the election of office-bearers had resulted as follows :—

President.—Mr. Alexander Masterton, of Edinburgh.
Vice-President.—Mr. J. W. Carmichael, of Barrhead.
New Members of Council.—Messrs. James Dickson, of Johnstone, and Robert Simpson, of Cambuslang.

Mr. Alex. Masterton (the President-Elect) said that he felt deeply grateful for the honour they had conferred upon him in electing him President of the Association for the ensuing year; and he trusted their confidence in him would not be misplaced. The names of many of those who had occupied this position were well known to some of them; and he would endeavour to discharge the duties of the office faithfully and conscientiously. He would do everything he could to promote the best interests of the Association, and to maintain the honourable record which it had held in the past.

Votes of Thanks.

Votes of thanks were passed to the authors of papers, to the Scrutineers, and to the Secretary (Mr. P. B. Watson), for the admirable manner in which he had carried through his onerous duties during the past year.

Place of Next Meeting.

The President said he did not think there would be much difficulty in deciding as to the place of meeting for next year. Personally, he did not think they could do better than come back to Edinburgh again. He thought this arrangement would be agreeable to the members.

The suggestion was unanimously endorsed by the meeting.

Presentation to the President.

Mr. David Vass (Perth) said a very pleasant duty now devolved upon him—that of showing, in tangible form, the appreciation they felt for their President. Mr. Scott had carried through his work in a very able and pleasing way. His duties that day had been signalized by quite a flourish of trumpets; and this had brought to a close a particularly hard year's work. The circumstances during the past twelve months had been so very different from what they had previously been, and the work on this account had been rendered more difficult and trying. Mr. Scott, however, had shown throughout the year conspicuous tact and wisdom. It therefore gave him great pleasure to present him with the gold badge of the Association as a memento of his successful labours.

Mr. Scott said the badge with which they had presented him would be greatly appreciated by him, and would be retained as a memento of an interesting year. It was an honour to be President of the North British Association of Gas Managers, and he hoped the younger members of the profession would aspire to the distinction.

The proceedings then terminated.

There has been forwarded by Messrs. Hazell, Watson, and Viney, of No. 52, Long Acre, W.C., a copy of the "Water-Works Directory and Statistics" for 1915-16, the price of which is 10s. 6d. It is the thirty-first issue, and, like the "Gas-Works Directory," it contains, in addition to much useful information regarding the various undertakings, a general index of officials of water-works, and a list of Associations of Water Engineers and Managers. A separate section is devoted to foreign water-works with offices in London.

STANDARDIZATION OF BOMB CALORIMETERS.

There has lately been issued by the United States Bureau of Standards a paper (Circular No. 11) describing briefly the methods of calibrating and using bomb calorimeters, such as are used in determining the amount of heat available from a given weight of coal or coke or other combustible.

The amount of heat which can be obtained depends largely upon the kind and quality of fuel. When purchased in large quantities, a fuel is commonly tested to determine the amount of heat available per pound, and the price paid depends upon the results of these tests. The instrument used for such tests consists essentially of a steel shell or bomb in which a small weighted sample of the fuel can be burnt in pure oxygen gas. The bomb is immersed in a known amount of water before the sample is ignited, the heat produced warms the water, and by suitable measurements of the change of temperature the amount of heat can be calculated.

Provision is made by the Bureau of Standards for standardizing these calorimeters by means of standard samples of certain pure materials—*viz.*, sugar, naphthalene, and benzoic acid. By burning known quantities of these substances in the bomb, the observer determines the amount of heat required to raise the temperature of the bomb, together with the proper amount of water, one degree. This being determined, the heat furnished by a given sample of coal burnt in the same bomb with the same amount of water can be found. Thus these standard samples, which are sent all over the United States, serve as standards of heat, and make it possible to obtain exactly the same results from tests made anywhere in the country, much as the use of the standards of length and of mass makes a yard or a pound the same in all parts of the country.

EFFICIENCY OF LIGHT UTILIZATION.

The principal known facts to be observed in planning the lighting of small interiors are summarized by Mr. J. R. Cravath in a paper read by him at a meeting of the Chicago Section of the Illuminating Engineering Society (U.S.A.) some little time ago. On points which are still subject of controversy, indications are given as to the course it is meanwhile advisable to pursue.

Dealing with the question of the efficiency of light utilization, Mr. Cravath says that by efficiency is meant the percentage of the light generated which is delivered on a plane level with a common table-top, 30 inches from the floor. This depends on (1) the colour or reflecting power of the ceiling, walls, and floor; (2) the shape of the room; (3) the reflector and globe equipment; and (4) the locations of the lamps.

Colour of ceilings, walls, and floors may, it has been demonstrated, make a difference of over four to one in the illumination. When dealing with common colours, however, a difference of two to one would, he thinks, be the ordinary range, unless it is attempted to use indirect lighting with a dark ceiling, when the ratio would be very high. A low square room will show the least loss of light by absorption, and a high narrow room the greatest. In other words, the greater the wall area in proportion to the floor area the lower the efficiency.

The globe or reflector equipment has a great influence on efficiency. But comparative figures on this must necessarily apply to only one given set of conditions, because the comparative rank of the different equipments will change with room colourings and lamp locations. For example, an indirect system is, obviously, more affected by ceiling colour than a direct system. As to locations of lamps, a central location is more efficient than locations near the walls.

A table covering efficiencies, even for the commonest of practical conditions, would be too bulky for ordinary use. The following will, however, serve to give some idea of the usual ranges of efficiency figures for certain conditions. For a typical room, 15 feet square by 9 feet high, assuming a light ceiling in each case, the light falling on the working plane in percentage of total light emitted by the lamp, with the light all generated by a tungsten or gas-mantle lamp at one central outlet, will be about as below.

	Per Cent.
Efficient bowl-shaped opal or prismatic reflectors at ceiling	45 to 60
Frosted enclosing globe at ceiling	25 to 40
Bare unshaded lamp near ceiling	30 to 45
Indirect, mirrowed reflectors.	25 to 35
Indirect, white enamelled reflectors	21 to 31
Mirrowed reflector, at ceiling, deep.	70 to 80
Aluminium finished metal at ceiling, deep . . .	45 to 60
White enamelled metal at ceiling	45 to 60

These figures apply to clean lamps and reflectors.

Among wills recently proved is that of the late Mr. Richard Clayton, the Managing-Director of the Cannon Iron Foundries, Limited, who left estate to the gross amount of £10,703.

GAS AND HYGIENE.

By Dr. M. von Gruber, Professor at, and Director of, the Hygienic Institute of Munich University.

(*Concluded from p.* 452.)

The Ventilating Effect of Gas Lighting.

In the author's experiments, the natural ventilation due to chinks in doors and windows, and the porosity of the walls, was extremely small. In this respect it agreed with the experiments made by Flügge, Emmerich, and other investigators. Pettenkofer appears, the author says, to have much over-estimated natural ventilation. In the experimental room, when not heated, lighted, or occupied, the ventilation averaged about one-third of the cubic capacity per hour. When the room was lighted by gas, but not heated, the exchange of air per hour amounted to about two-thirds of the cubic capacity of the room. Naturally, the ventilation varied in different experiments—being much influenced by the strength of the wind. In a few cases when tests were made in a strong wind, the ventilation exceeded the cubic capacity of the room. It is obvious, however, that gas lighting does not suffice to improve the air of an occupied room, by increasing the ceiling ventilation, to such an extent that the air becomes better than that of an electrically lighted room, as has been contended, especially in England. This contention is most certainly wrong, as figures in Table IV. show.

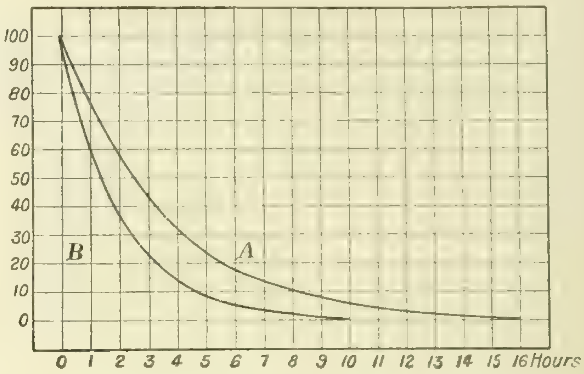


Fig. 3—Showing the number of spores found in suspension in the air at each hour per hundred spores suspended in the air at the beginning of the test.
A = in the room without gas; B = in the room with gas burning.

Effect of Wall Paper, Flues, Opening of Doors, &c., on Room Ventilation.

Experiments were next made with a view to seeing whether the ventilation of the rooms could be improved in any simple way. Originally, both rooms had a light wall paper which had become somewhat dirty through lapse of time. Later the paper was stripped from one of the rooms and the walls distempered white, and subsequently the other room was treated in the same way. The white distempered walls naturally caused a considerable increase in the illumination on the table or desk in the room. The results of observations of the temperature, humidity, proportion of carbonic acid, and ventilation of the papered and distempered rooms showed that the ventilation was 17 per cent. greater in the distempered room. On this account distemper seems preferable, and the author sees no hygienic advantage in wall papering. The tabulated results show that the proportion of carbonic acid in the air of the room at the end of each test was appreciably lower with distempered than with papered walls.

Other parallel experiments were made to ascertain the effect of different methods of ventilation. One pair of experiments shows the effect of opening wide and closing the door once every half hour during a seven-hour period. The ventilation was improved by about 10 per cent. by this periodical opening of the door. Other sets of tests compared the effect of taking the air supply to the gas-stove from the corridor with taking it from the room itself. The supply of air to the gas-stove from the room itself improved the ventilation by about 20 per cent. An ordinary stove [of the Continental type], consuming coal or wood, would, the author considers, have a still more thorough ventilating action. In other tests the effect of opening the window flap while the gas-stove took its air supply from the room itself was tried, with the result that it was found that the ventilation was thus increased by 74 per cent. Finally, a series of tests were made in which the vent pipe in the ceiling was opened. This was most effective, the ventilation being increased 2½ to 2¾ times, and in one case even 5 times. Obviously, this increased ventilation must affect the humidity of, and proportion of carbonic acid in, the room. The author thinks, however, that these tests with the open vent pipe have not much practical significance, as the lower classes do not have any provision for ceiling ventilation in their living rooms, and probably would not use it if they had. First and foremost they wish to retain the heat, and not allow it to be lost through the ceiling.

Table IV.—*Effect of Occupancy on the Air of a Room.*

Date of Tests.	Duration of Tests.	Number of		Total Production of CO_2.	Mean Rise of Temperature During Test.	Relative Humidity (Per Cent. of Saturation).		Increase in CO_2 in the Air.	Ventilation. Cubic Feet per Hour.
		Occupants.	Gas-Burners.			At End of Test.	Increase During Test.		
1915.	Hours.			Cubic Feet.	°Fahr.			Parts per 10,000.	
Jan. 28	4	5	—	16·0	6·3	50	7	27·9	1804
	4	5	1	19·2	5·4	54	12	34·8	1786
Feb. 28	6	6	—	19·1	6·1	57	21	35·8	1963
	6	6	1	24·3	7·4	58	22	44·1	1857
March 6	6	6	1	33·9	9·2	60	29	45·5	1772
,, 11	6	8	1	41·3	10·4	62	31	60·9	1670
,, 17	6	10	—	47·9	7·4	67	39	80·0	1310
July 7	6	12	—	57·4	9·7	83	25	110·5	1059
,, 31	6	12	—	57·4	10·1	82	20	125·5	854
Aug. 7	6	12	—	57·4	10·4	88	15	118·5	893

In this table two pairs of testings afford comparisons between the electrically lighted room and the gas lighted room—both with the same number of occupants for the same period. The proportion of carbonic acid in the air at the end of the test was always higher with the gas-lighted room, and the humidity was also increased to a greater extent by gas lighting, though in one pair of experiments the difference was very slight. There is no difference in the ventilation—if anything the ventilation appears smaller in the gas lighted room. Stress should not, however, be laid on this observation, as the determination of ventilation in tests with human beings is rather uncertain, because the carbonic acid produced by five or six people cannot be actually measured, but must be calculated from the standard figure of 8 cubic feet of carbonic acid produced per head per hour. There appears to be no doubt, however, that the expectation that gas lighting can improve the character of the air of a room is not fulfilled.

The author's tests likewise fail to substantiate the view that the air of a room lighted by gas becomes freed from organic smell more rapidly than that of an electrically lighted room. Various tests were made. Sauerkraut was cooked for some time in the rooms, and observations were made with cigar smoke. No difference could be observed; for as long as the smell could be detected the intensity appeared to be about the same in both cases, and the time which elapsed before the smell vanished was also the same in both rooms.

The contention, which likewise came from England, that gas lighting disinfects living rooms by destroying the organisms in the air, was made the subject of extended experiments carried out by Dr. Knud Ahlborn. Harmless organisms—viz., the spores of the hay bacillus dried on powdered talc—were introduced into the air of the room by blowing up the dust constantly by electrically driven bellows from eight different points on the floor of the room. At definite intervals measured samples of air were sucked through a Ficker-Hahn filter, and the number of organisms retained thereon was determined. It was not possible to keep the proportion of organisms in the air at the same height in the room more than quite approximately constant, even though the finest dust was used. Constant settling of the organisms occurred; and as it was impossible to reach all parts of the floor with the jets of air, the organisms settled freely in still corners. Fig. 3 shows the results of these experiments.

The curves given represent the average results of a series of tests. It will be seen that there is a rather more rapid fall in the proportion of organisms in the air of the room lighted by gas than in that lighted by electricity; but the author considers the difference inconsiderable and of no practical significance.

Conclusion.

The author, in concluding his review of the tests made at the Munich Hygienic Institute, says that at the outset no one there doubted that gas lighting was inferior to electric lighting for living rooms in respect of the air, since electric lighting does not contaminate the air, develops no moisture, and produces little heat. It was a question of the extent of the difference between the two. The tests have undoubtedly shown that, even in unfavourable conditions, such as small living rooms present, the changes in the conditions of the air caused by gas lighting are not nearly so great as has been frequently supposed. It should be pointed out that the results obtained naturally only apply to the experimental rooms used. In other experimental conditions great differences might be found; but, on the whole, it would not be easy to find much more unfavourable or worse conditions for gas lighting than in these tests, which were carried out with small differences of temperature between the interior and exterior, and therefore with the ventilation at its worst. The tests demonstrate without question that the changes of temperature and humidity, and the contamination of the air by carbonic acid, nitric oxide, sulphurous acid, and carbonic oxide, are not sufficiently great to come into consideration from the hygienic standpoint. They do not indicate that gas lighting is undesirable in living rooms. This conclusion the author believes can be accepted with entire confidence.

One point has not been touched upon—viz., the toxicity of coal gas itself. In regard to this, the author would make one observation, not from these tests, but from his daily experiences—viz., that while the bye-pass flames or pilot jets for lighting gas-burners doubtless constitute an advance and a great convenience, the fitting of these jets is frequently faulty. It is obviously an easy matter technically to do this fitting so that an escape of unburnt gas cannot take place; but quite commonly there are small escapes which, when continuing over a long period, may well be injurious. The author has an extremely sensitive nose, and smells tiny quantities of coal gas.

Discussion.

The discussion on the paper was opened by Professor H. Bunte, who expressed the thanks of the meeting to the lecturer for the extremely careful work on which he had reported. The Professor observed that more than twenty years had passed since an exhaustive investigation of the hygienic aspects of gas lighting had been made, and that since then incandescent lighting had become predominant. Nevertheless, text-books on hygiene still quoted results based on the use of argand and flat-flame burners. Those who had not undertaken similar investigations could scarcely appreciate the time and trouble entailed in the carrying out of an exhaustive research of this kind. Generally speaking, it was a case of detecting traces of gases and of forming a proper judgment on their effect on the health of the human being. It was clearly incumbent on the German Association to support, by all the means at their disposal, investigations of this kind; and there was no one they could look to with greater confidence to make them than to the successor of Pettenkofer in the Professorial Chair at Munich. The report of the investigations showed the great amount of detail involved in their prosecution. Dr. von Gruber had pointed out that his comparisons between gas and electric lighting had been made in conditions extremely unfavourable for gas lighting. These conditions had been chosen so that the greatest effect of gas lighting on the air of the room would occur—small rooms without special ventilation having been used. Notwithstanding this, the difference between gas and electric lighting had been shown to be very trifling. Dr. von Gruber had confessed to surprise that the increase of temperature from gas lighting was so small as compared with electric lighting. It had to be remembered that since the introduction of incandescent gas-burners considerably better illumination was obtained with one-tenth the gas consumption of earlier days; and thus the basis of the old prejudices against gas lighting from the hygienic standpoint had been undermined. The work of Dr. von Gruber and his collaborators led to the conclusion that there was no possible objection from the hygienic point of view to gas lighting carried out in a reasonably proper manner. The products of combustion of gas, apart from carbonic acid and water vapour, occurred in the air of a room in such infinitesimal quantities that they had no possible hygienic significance.

Some precise information on the products of combustion of different gas flames and burners had been obtained by Dr. Terres (one of Professor Bunte's pupils) by testing air taken directly above the burners. The objectionable products were naturally found in this case in a higher degree of concentration than when they were sought for directly in the air of the room. These investigations, however, showed that in gas-flames burning in the ordinary way only trifling traces of products of incomplete combustion occurred, and the most delicate methods of analysis were required for their detection and quantitative determination. As regarded ventilation, Dr. von Gruber had not found support for the English contention that gas lighting increased the ventilation of rooms. It should, however, be observed in this connection that the comparative experiments upon the air in the rooms lighted respectively with gas and electricity had been made in rooms entirely without ventilation. Summarizing the results of Dr. von Gruber's comprehensive and careful comparative tests between rooms lighted with gas and electricity, it might be said that the quantity of products of combustion from gas lighting—such as carbonic oxide, nitric oxide, sulphurous acid, &c., and, to a less extent, carbonic acid, the harmfulness to health of which had been dogmatically asserted and disseminated in a most far-reaching manner—had been proved to be quite insignificant from the hygienic standpoint. Carbonic acid resulting from combustion had been shown to be identical in its action with carbonic acid resulting from breathing or pure artificial carbonic acid. These were results of great value in combating the prejudices raised against gas lighting on behalf of electric lighting. The view that gas lighting enhanced ventilation had never been expressed in Germany; and it gratified the speaker (Dr. Bunte) that the tests had not given support to advantages which could not be sustained. In one respect special attention should be paid to Dr. von Gruber's views—that gas lighting would advance more rapidly if greater care were paid to the fitting in order to enhance convenience and avoid smell. This, however, was no question of scientific investigations, but solely one of technical training and careful work.

Herr Göhrum, the Manager of the Stuttgart gas undertaking, said the exhaustive report of Dr. von Gruber culminated in the point that both the so-called disadvantages as well as the alleged advantages of gas lighting crumbled to nothing. So much had been heard for years past against gas lighting that it became a matter of wonder that other equally great hygienic faults in dwelling houses, such as overheating, had not been studied more closely. Increase of temperature to an extent which the lecturer had said was objectionable hygienically was much more liable to occur in living rooms from coal and coke stoves, which were provided with only restricted means of regulation. The rise of temperature from such stoves could be much more disadvantageous than any rise of temperature from gas lighting. The practical conclusion he (Herr Göhrum) would draw was that, in order to get rid of the irrational heating of rooms by solid fuel, gas should be supplied for heating purposes at a low rate, and that convenient regulators of gas-fires should be provided in order that rooms might be heated with only small fluctuations of temperature. Experiments had been made with such apparatus at Stuttgart, and it had been found feasible to check gas heating automatically when a lamp was lighted or when the room became more fully occupied. As regarded the ignition of gas-burners, he (Herr Göhrum) had found the "Perio" method of lighting gave to gas all the advantages of electric lighting and was absolutely trustworthy; so that in Stuttgart they now used no other lighting appliances. There were doubtless other good devices; but this was the one which had been specially tested there, and had been found quite satisfactory. In conclusion, he would observe that, while it might be concluded from the lecture that gas used for lighting did not vitiate the air of living rooms, it was clear that, as a heating agent and in other ways, gas had greatly improved the conditions of such rooms.

Herr Schomburg, the Manager of the Gelsenkirchen Municipal Gas-Works, referred to the opinion expressed by Dr. von Gruber that coal-stoves would effect better ventilation than gas-stoves, as the chimney temperature would be higher. He thought this was a wrong opinion, as with the slow-combustion stoves now generally in use the quantity of air taken from the room into the chimney depended on the air control beneath the grate of the stove, and only a very small quantity of air was required to provide the necessary heat. This air supply was undoubtedly considerably less than with gas-fires in which the communication between the room and the chimney was always freely open. Consequently the ventilation with gas-fires would be better than with (close) coal-stoves. He (Herr Schomburg) also thought that ventilation could easily be improved if the heat from the gas-burners were utilized by means of ventilating shafts. Many such arrangements had been provided by the Berlin Corporation Gas-Works, the Potsdam works, and others, and had behaved well. In regard to Herr Göhrum's remarks, he did not think that coal-stoves could be entirely superseded by gas heating; but there was still a large part of the heating requirements which could best be met by gas, especially in the transition seasons of autumn and spring. Gas heating was especially applicable to rooms where constant heating was not needed. The complaints of leakage from pipes or pilot jets arose chiefly from the defective taps which were largely sold. If the gas undertakings took a greater part in controlling the fittings, these complaints would vanish. At Gelsenkirchen, a considerably more substantial bye-pass tap had been used, which did away with the fault complained of.

The Rare Earth Industry.—There has just been published by Messrs. Crosby Lockwood and Son a book entitled "The Rare Earth Industry: Including the Manufacture of Incandescent Mantles, Pyrophoric Alloys, and Electrical Glow Lamps," by Sydney J. Johnstone, B.Sc., together with a chapter upon "The Industry of Radioactive Substances," by Alexander S. Russell, M.A., D.Sc. The volume is the second of a projected series of manuals on Industrial Chemistry which are being prepared under the editorship of Geoffrey Martin, Ph.D., D.Sc., B.Sc. A fuller notice of the contents of the book (which is published at 7s. 6d. net) will be given in a subsequent issue.

Gas-Works Statistics of Japan.—Statistics for the year 1913 prepared by the Imperial Gas Association of Japan show that there were at that time in operation in Japan proper 75 gas companies, as compared with 74 in the previous year; and in the Colonies four, against three. The small net increase is due to amalgamations and dissolutions of local gas companies which were brought about during the year. Several additional works were at the time in course of construction. Most of the undertakings were, of course, manufacturing coal gas; but in one case natural gas was utilized, and in four others acetylene. The natural gas industry of Japan is not yet developed to any considerable extent; but a scheme has been under consideration having this object in view.

THE NORTH BRITISH ASSOCIATION PAPERS.

READ AND DISCUSSED IN EDINBURGH, FRIDAY, SEPT. 3.

SALES OF SULPHATE OF AMMONIA AT HOME AND ABROAD.

By F. C. O. Speyer, of London.

On behalf of the Sulphate of Ammonia Association I wish to thank you for permitting me to be present to-day, and for affording me so good an opportunity of explaining and enlarging upon one or two aspects of the problem of sulphate of ammonia sales.

Competition from Synthetic Ammonia.

The broad facts of the situation are known to all, and there is fortunately no dispute about them. We are all agreed that sales of sulphate of ammonia in the British Isles are not nearly as large as they could and should be; and we all know that the world's production of nitrogen, whether in the form of sulphate of ammonia, nitrate of soda, cyanamide, or Norwegian nitrate of lime is rapidly increasing. Furthermore, we have lately learnt that, owing to the war, the Germans have vastly enlarged the plant by which they produce synthetic sulphate of ammonia testing 25 per cent., so that the total German production will probably amount to some 800,000 tons in the near future.

These are the facts. The conclusion to be drawn from them is that after the war competition in the world's nitrogen market will be more severe than ever before, and that this competition will inevitably have the effect of reducing the level of price by many pounds per ton, unless old markets can be developed and new outlets found. So far I think we are all agreed. As to the ways and means of dealing with the situation which confronts us, there will, of course, be differences of opinion.

Propaganda Work.

I may perhaps remind you here that the Sulphate of Ammonia Association (or rather the Sulphate of Ammonia Committee, as it used to be called) has for a number of years been carrying on propaganda work both at home and abroad. As a result, the sales in this country have shown a steady increase year by year, and fresh markets have been largely developed abroad. Our work in this country has hitherto been on scientific rather than commercial lines, although advertisement has formed a large part of our activity; but we have now come to the conclusion that the commercial side of the problem should receive more attention.

Cultivating the Home Market.

It has been the unvarying experience of those who have succeeded in promoting a large increase in sales in foreign countries that it is not enough merely to demonstrate to the farmer the use and value of sulphate of ammonia. If he is to take to sulphate of ammonia, you must ensure that he has close at hand a never-failing source of supply; and if he is to give preference to sulphate of ammonia, you must endeavour so to regulate the price that sulphate is at least as cheap, unit for unit, as other forms of nitrogen which can be used in a similar manner.

Now the best way to secure for the farmer a constant supply ready at hand is to encourage manure and agricultural merchants to stock sulphate of ammonia. There are three distinct advantages in this method, as against the method of direct selling by the producer to the farmer:

(1) As soon as the merchant has a stock to dispose of, he will naturally set about getting as many orders as possible. This means a good advertisement for sulphate of ammonia; for the best form of advertisement is undoubtedly the living one.

(2) The producer is not faced with the problem of having to give the long credits which farmers so often require, and which the manure or corn merchants are in the habit of granting.

(3) The farmer always knows where he can get sulphate of ammonia, for the merchant draws his supplies from different producers; whereas if the farmer is in the habit of buying direct, it may often happen that his particular friends are sold out, in which case he is more likely to buy nitrate of soda—always obtainable close at hand—than take the trouble to write round to producers of sulphate of ammonia at a distance.

The Association therefore ask you to support the manure and corn merchants, and make it a rule to keep your price to farmers at 10s. per ton above the price to merchants. Let me deal with one or two misconceptions which appear to have lately arisen in this connection.

In the first place, let me say that this 10s. per ton which we are asking you to allow the merchant does not really represent any additional sacrifice to the producer. For years now the prices of sulphate of ammonia have been established on a basis of a discount of 3½ per cent. All we ask you to do is to allow this same 3½ per cent. to the home merchant, just as you do to the export merchant—merely making the allowance up to 10s. per ton whenever 3½ per cent. on the price amounts to less than 10s. per ton.

Secondly, we realize that a large number of producers (especially those situated in the midst of agricultural districts) have for years been building-up a direct trade with farmers. We do not ask you to give up direct selling immediately. We take the view that if the merchant is to make 10s. per ton, he must do something to earn it. We therefore ask you to say to merchants: "We will maintain a difference of 10s. per ton between our prices to you and to farmers whether we do the business through you or direct; but if you want the 10s. per ton, it is up to you to induce the farmer to give you his orders." I may add that the Association, not being in the happy position of having direct farmer customers, make it a practice to refer all inquiries from farmers to merchants.

Thirdly, and lastly, we often receive letters from producers asking why they should lose 10s. per ton to please the Sulphate of Ammonia Association. Well, I do not admit that they will lose anything in the long run. We are firmly convinced that it is only by enlisting the support of merchants that we can hope to effect a large increase in sales here. Every increase in the quantity sold here tends to raise the price both here and abroad; and in this way I feel convinced that producers will be more than compensated for the apparent present sacrifice of 10s. per ton. After all, the 3½ per cent., or 10s., is always allowed to the export merchant; so that three quarters of our total make is already sold under this disadvantage. I understand that north of the Tweed, at any rate, the policy I have outlined above has been acted upon for many years already; so I hope I have so far been preaching to the converted.

Overcoming Price Fluctuation.

Now I come to the recommendations of the Special Sub-Committee of the Association appointed to deal with the question of home sales. From inquiries made among factors and merchants, we are convinced that one of the principal causes which militates against increased sales to them in this country is the difficulty of saying at any given moment what the price of sulphate of ammonia is. This is due to the fact that producers are constantly competing one against another. Last season we had several instances of prices at two gas-works only about fifteen to twenty miles distant one from another differing by as many shillings per ton. Added to this, there are constant fluctuations in the general level of price.

These differences naturally make merchants chary of committing themselves and encourage farmers to wait till the last moment before buying. The result of this is a rush of orders in the spring, frequent disappointments and consequent loss of orders which go to sellers of nitrate of soda and nitrolim instead. Merchants should be encouraged to buy as far ahead as is reasonable; but they will only do so if they can feel reasonably secure against being undersold when the time for taking delivery arrives. If producers have sales on their books by the end of September or October for the greater part of the quantity required by British farmers in the spring, the market will be enormously strenthened thereby.

In order to steady prices as much as possible, the Association, therefore, ask producers in the various districts throughout the country to agree upon one fixed price for home sales. The price is to be fixed by the producers themselves at meetings to be held at the end of each month in each district; and the price fixed is to remain in force for one calendar month. Let me take an example: At the end of September prices will be fixed which will come into operation on Oct. 1, and be maintained till Oct. 31. The prices might be fixed thus: For October-November delivery, £15 5s. per ton in single bags for 24½ per cent. ammonia minimum guaranteed free on rails at works, net cash to farmers, and cash less 10s. per ton to merchants; for December-February, £15 7s. 6d.; and for March-May, £15 10s. At the end of October these prices could be maintained if the situation warranted it, or raised or lowered. The prices will, of course, have to bear some relation to the export value at the nearest large shipping port for prompt and forward delivery; and producers should always take account of the price of nitrate of soda when fixing.

We recommend producers always to supply bags for home sales; but if they cannot, or will not, do this, an allowance of 5s. per ton of sulphate should be made in lieu of bags.

Those makers who guarantee 25 per cent. will, of course, expect to get a higher price, which should also be fixed. I hope that 25 per cent. will have become the normal guarantee before the war is over.

Now I think that this scheme is a perfectly workable one if applied the right way; but there are certain obvious difficulties. What may be a high price for one maker will appear a low price for another. To obviate this, the districts will have to be carefully delimited. We hoped at first that the districts might be coterminous with the Gas Association areas; but it appears that such districts would be too large. If the general principle of our scheme finds acceptance, therefore, we propose to visit producers personally and arrange the largest possible groups compatible with unity of geographical interest.

I think I have said enough to give you a general idea of the scheme; but I shall be pleased to endeavour to answer any questions afterwards.

Combination v. Competition.

The outstanding fact about the proposal is that it represents an attempt to substitute combination for competition among manufacturers. In other words, we ask you to fix a price which you consider a good enough figure at which to sell, without troubling whether you could obtain an extra 2s. 6d. per ton or undersell a fellow-producer by 2s. 6d. per ton on any particular occasion. You will have noticed that we give great prominence to this principle in the *brochure* which we issued early in August.[*] I look forward to the time, which I hope is not far distant, when competition between British manufacturers of sulphate of ammonia will have ceased altogether—leaving us free to use our united energies to fight our foreign competitors, to maintain our position in the world's markets, and to find new outlets for our product.

The 25 Per Cent. Standard.

In order to be able to work closely together, it is very desirable that there should be substantial agreement as to quality and conditions of sale. And this brings me to the question of making 25 per cent. ammonia, on which I have been asked to say a few words. If I wished to deal with the subject in detail, I feel I could not do better than read you the pamphlet "Does it pay to make 25 per cent. Ammonia," which the Association issued a few weeks ago.[†] I will assume, however, that you have all glanced at the pamphlet, and will confine myself to the main features of the question. One of the great stumbling-blocks to a proper grasp of this question is the persistence in contracts of what I should like to call the "time-dishonoured" guarantee of 24 per cent. That guarantee is to-day absolutely worthless; and the best proof of this is that sulphate of ammonia which only tests 24 per cent. is to-day fortunately almost as rare as the Great Auk.

I have recently had some correspondence with a manufacturer of sulphate, who has taken the Association politely, but roundly, to task for advocating a standard of 25 per cent. without demanding a corresponding increase in price. That is to say, he is not prepared to make 25 per cent. unless he can get 4 per cent. more in the price than he is getting for 24 per cent., and he stigmatizes the Association's efforts in this direction as contrary to sound business principles. He would be perfectly right in this contention if the majority of manufacturers made sulphate of ammonia which really only tested 24 per cent. But they do not. And if they did, those who were making 25 per cent. would probably find they could obtain something in the neighbourhood of 4 per cent. more. Makers have destroyed the force of this argument by their own action. For although many still only guarantee 24 per cent., practically all makers now deliver salt testing nearly 24½ per cent., while the good makes test 24¾ per cent. and over.

In my opinion, the real operative guarantee of British sulphate of ammonia, on the strength of which merchants buy our salt, lies somewhere between 24½ and 24¾ per cent. Therefore, if a maker of 25 per cent. obtains 2s. 6d. to 3s. 9d. per ton more than a guarantor of 24 or 24½ per cent., I should consider that the 25 per cent. maker was obtaining the full extra to which he was entitled. I am speaking now merely from the point of view of the guarantees given or implied for good sulphate of ammonia. I do not deny that there is a great deal of bad sulphate of ammonia still made; and I think that the maker of bad sulphate very often escapes too lightly owing to the fact that merchants usually ship parcels from several different works at the same time, and the good averages-up the bad.

My first contention, then, is that, if you are comparing prices, you must assume that buyers expect to get a minimum of about 24¾ per cent. whatever guarantee they buy on. The view seems to be held in some quarters that all this agitation for 25 per cent. is merely the work of the merchants, who wish to get better prices from their buyers and pocket the difference at the expense of the manufacturer. I do not think this view would be held if sulphate of ammonia had not been for years a sort of Cinderella among the bye-products. While producers have sold gas and other bye-products of coal, and indeed coal itself, direct to consumers, and have therefore become fully cognizant of consumers' requirements in relation to these products, the sulphate of ammonia market has been developed by middlemen. My personal belief is that if makers here had sold their sulphate direct to overseas consumers, the standard guarantee would long ago have been raised to 24¾ or 25 per cent. I have had a good deal of personal experience in foreign markets, and can unhesitatingly say that the demand for better quality has come, in the first instance, from the consumer, and not from the merchant, who, after all, is only there to supply what the consumer wants.

Now, if we were the only, or even the largest, producers of sulphate of ammonia in the world, as we were for many years, we could be our own arbiters as to quality. Buyers would, of course, prefer to buy 25 per cent.; but if they could not get enough of this, they would have to take inferior qualities, and each maker could decide for himself whether it was worth while making 25 per cent. or not. Even so, I believe that, given the increase in the production of other nitrogenous fertilizers, and the care which these producers take to deliver their stuff in the form most acceptable to users, makers of sulphate would in the end have been compelled to make the best possible salt.

The Nitrate of Soda Fable.

The Sulphate of Ammonia Committee from 1898 onwards have been successfully exposing the fable that nitrate of soda possesses any peculiar qualities which make it intrinsically preferable to sulphate of ammonia, regardless of price. But consumers are carrying this process one step further; and the tendency nowadays is to give a preference to the cheapest form of nitrogen. And in the category of cheapness are reckoned qualities, such as good mechanical condition, which represent a saving in the cost of application.

Only sulphate of ammonia with a very low content of moisture and free acid, and consequently high percentage of ammonia, can be in good condition. We have to-day staring us in the face a most striking example of the extent to which forms of nitrogen are interchanged. In 1913 Japan took from us 114,000 tons of sulphate. For the first seven months of this year she has had not quite 9000 tons; and even if we assume that the shipments for the remaining five months total 20,000—an optimistic estimate—there will be a shortage of 86,000 tons as against 1913. Increased Japanese production may account for 20,000 tons; the rest of the difference is due to the use of bean cake and nitrate of soda. because they have been cheaper forms of nitrogen. I make no apology for the length of this digression, because the facts seem to me to have an intimate bearing on the question of quality.

I remarked that if we were still the largest producers of sulphate of ammonia, the question of 25 per cent. would not be so insistent. But we all know that we no longer occupy this proud position. The German production will soon be approximately twice as large as ours; and practically the whole of this tests 25 per cent. This makes it quite certain that in the future there will be plenty of 25 per cent. sulphate of ammonia to be had at a reasonable price; and there is not the slightest doubt that buyers prefer 25 per cent. whenever they can get it.

If we are to be able to compete in the world's markets, we must be able to offer a quality equally as good as the quality others are supplying. I do not say that it will be absolutely impossible to sell lower qualities; but I maintain that whereas the maker of 25 per cent. will have the whole world's markets open to him, lower qualities will have to find outlets where they can, after the 25 per cent. makers have taken the pick of the orders. This, I think, is the great central fact in the situation, and no amount of argument as to what has been the practice in the past, and what the cost of making 25 per cent. may be, can alter this fact. We may all admit that the British maker has done very well with his 24 per cent. guarantee in the past. Seeing that he could sell 4 or 5 per cent. of moisture and free acid as if they were ammonia, he would have been a fool if he had not done so. But times change; and unless we change with them, others will cut us out. That is why the Association recommends all British manufacturers of sulphate of ammonia to make 25 per cent. now, in order to consolidate our position in foreign markets during the war, and keep the Germans out afterwards.

DISCUSSION.

The President (Mr. J. B. Scott, of Cowdenbeath) said this was a subject in which every gas manager was interested, whether he manufactured sulphate of ammonia or not, because the selling price of sulphate of ammonia, as they knew, regulated the value of ammoniacal liquor. He had been somewhat interested in the point raised in the paper regarding dealing with merchants, because it just occurred to him that this was a question which could be looked at in two or three different ways. In the place where he was located, his experience was that he could find a demand for the sulphate of ammonia which they manufactured at the works in the district immediately surrounding Cowdenbeath. In some instances, he had sold direct to the farmers; but in the majority of cases he sold to the merchants. His reason for adopting this course was because the merchants dealt with the farmers, and purchased grain, straw, and hay from them. In point of fact, the merchants had a sort of contra account with the farmers. The arrangement seemed to suit both parties, and worked out to their mutual satisfaction. At the Cowdenbeath Gas-Works they naturally wanted to get in their money as quickly as possible; and his experience had gone to show that the accounts were paid much more expeditiously by the merchants than by the farmers. Then, again, they had come to regard these merchants as more or less their agents. It was not always convenient for a gas manager or his staff to canvass the farm-houses for orders for sulphate of ammonia. Such a method of canvassing might be adopted for gas-cookers; but a manager was not quite disposed to solicit orders among the farmers for sulphate of ammonia. The merchants were in a way their agents; and, being so, they required to be paid. If this scheme was gone about in a systematic manner, he was very hopeful of its success.

Mr. Alex. Yuill (Dundee) said a better paper could not have been placed before the Association—especially at the present time—than the one they had heard read by Mr. Speyer. They (in Dundee) had now affiliated themselves to the Sulphate of Ammonia Association; and his view was that the Sulphate Association was playing its part nobly, and assisting them to a greater extent than many were quite conscious of. Before they became associated with the Sulphate Association, the price of sulphate of ammonia was down to between £8 or £9 a ton; but now they were able to command £14 10s. to £15 a ton for it. Personally, he thought this was largely due to the energies of the Sulphate Association. At the present moment, they ought to realize that the Germans, who were now our enemies, had been trying to steal the trade from us. At this juncture, they ought to enlist the sympathy and co-operation of purchasers of sulphate of ammonia.

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[*] See "Journal," *ante*, p. 344.

[†] *Ibid*, p. 124.

He thought they were entitled to give Mr. Speyer a hearty vote of thanks for his informative paper.

Mr. David Vass (Perth) observed that Mr. Speyer might inform them if he knew of any method by which they could get 25 per cent. sulphate of ammonia without the use of a whizzer.

Mr. Speyer, in acknowledging the vote, said he had to thank the members for the kindly approval with which they had received his paper. He had to confess that he came before the North British Association in fear and trembling, because he was afraid he might be met with all sorts of criticism and opposition. If he could take it that the general principle of the paper had appealed to the members, he would go South again very much encouraged. Through the Scottish Office—and he took it many of them knew Mr. Young, one of the officials there—it was proposed later on to organize an effort by which the gas managers would be seen and interviewed personally—the idea being to get the scheme of fixing prices put into working order. In reply to the question asked by Mr. Vass, he might say that the Association were at present conducting experiments to ascertain if it was possible to get the 25 per cent. sulphate without the use of the whizzer. It certainly was more difficult to secure it, and, indeed, in cases where the employment of a centrifugal machine or a whizzer was not prohibited, it certainly would be better to instal a whizzer. Provided they had a properly-constructed draining-board, and the sulphate of ammonia plant was otherwise satisfactory, he did not himself think there would be any difficulty in regard to the 25 per cent. make. They had now technical experts attached to the Sulphate Association; and they would be pleased to send them out among gas managers, so as to deal on the spot with any difficulties that might arise.

A SIMPLE PRESSURE-RAISING DEVICE.

By James J. Scott, of Lower Largo.

At the present time there are many methods by which the pressure of gas may be raised, and which are all more or less well known. They consist of blowers, fans, boosters, and such like plant; but the pressure-raiser which I am about to describe may possibly appeal to you (as it has to me) as being a small, simple, cheap, and efficient device.

Previous to the erection of the gas-works in Kennoway and Largo districts, there were three separate lighting areas using paraffin oil for public lighting; and on the introduction of a gas supply, the authorities naturally wanted the new light. They further wanted it on the most up-to-date principle, and at the same time within the limits of their finances. After these lighting committees had visited various places, and made inquiry as to the results of automatic systems, they decided to instal the pressure-wave apparatus. The Gas Company offered for, and carried out, the work of erecting the lamps in the three districts, and arranged contracts to maintain the street lighting in every respect.

The introduction of these appliances required an increase of pressure to operate them which I was unable to give, owing to the reserve of pressure at the works not being sufficient. This occurred at both works; and I was compelled to think out some scheme of overcoming the difficulty. Various methods suggested themselves to me: (1) Weighting the holder; (2) installing a fan or booster; and (3) the idea of temporarily converting my exhauster into a booster. I had strong objections to the first method, owing to the possibility of straining the crown of the holder; and in the second method, financial considerations came up against it. I was now left with the last idea, which was the cheapest and easiest to adopt; but after passing through the school of experience with this arrangement, I again came to the conclusion that something else would require to be adopted to obtain the simple, satisfactory results which I had in view.

I had many thoughts on this matter, and ultimately I saw the possibility of steam being used as a suitable agent. What confronted me then was how to utilize it, and what the effect would be. A few crude experiments and tests convinced me as to the ultimate results; and I have now had a device working at both places for almost a year with entire satisfaction.

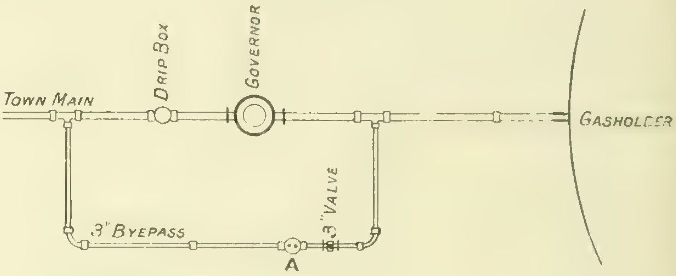
A description of the device can be easily obtained from the drawing; but I might supplement it with a few remarks. The body or chamber consists of an ordinary drip-box with double faucets; and into one of these faucets a bell-shaped conical horn is inserted. A steam supply is brought in through the cover, and the nozzle of the jet is accurately fixed in the centre and in line with the mouth of the horn. The supply of steam is regulated with a micrometer valve; while on the inlet side of the chamber an ordinary gas-valve is fixed. A syphon-pipe is introduced on the outlet to drain back the condensation into the chamber, from which it can be pumped; while a pipe is taken from the side near the bottom, and brought to the surface for the purpose of attaching the pump.

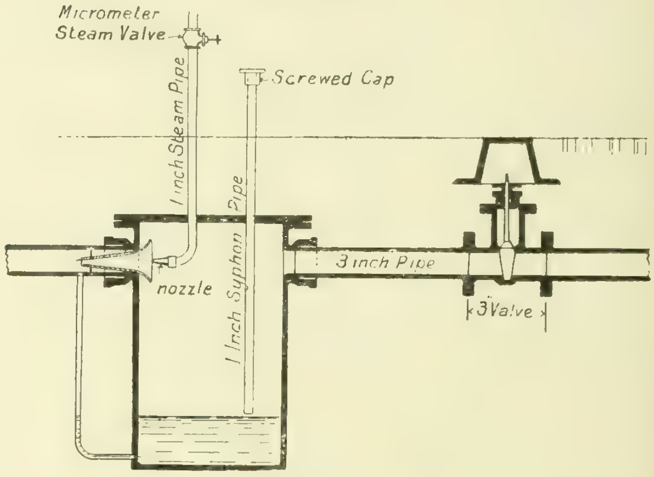
Another drawing shows the arrangement necessary to adopt the device, which I might explain in a few words. The station governor and its connections have to be bye-passed by means of a suitable size of pipe, on which is placed the injector-chamber and the valve.

To create a pressure-wave, the gas-valve is opened, allowing a supply of gas forward to the steam-nozzle. Then the steam-valve is opened slowly, and the action of the steam passing through the horn carries the gas at a high velocity into the district main pipe, gradually increasing the pressure, which, in turn, automatically closes the governor, which prevents the gas passing back to the holder. By controlling the quantity of steam, the wave may be increased to any desired pressure; while the time taken is under the full control of the operator. The steam is gradually shut off, allowing the district pressure to come back to normal, when the station governor again assumes control. The slow, steady increase and decrease obtained are hardly detected by consumers, and are much more effective than any other system in their duty towards the apparatus operated.

The effect of putting steam into the gas is not injurious in the least, as the steam in taking forward the quantity of gas it does is immediately condensed into water, and finds its way to the nearest drip-box, where it can be removed. With one of the installations under my control, the pipe leading from the injector chamber to the main is laid with a run-back to the chamber for a distance of 15 yards, and then turns towards the main pipe. This being so, I have found that the steam does not travel the distance of 15 yards, because about three gallons of water are taken from the injector chamber every week while the device is in operation, and no alteration is noticeable in the quantity taken from the main-pipe drip, which collects about one gallon per month. Another point, bearing on the non-effect of the steam, is the fact that several small bunsen bye-passes are in use throughout the works, and these are quite unaffected.

Pressure-Raising Device.





Enlarged Detail at "A."

To ascertain the temperature effect of the steam, I had a very fine thermometer inserted in the delivery pipe a distance of 21 yards from the injector chamber. The temperature of the atmosphere registered 70° Fahr., while in the gas-pipe, which is laid at the part with only one foot of cover, it was 60·5° Fahr. During the action of the wave, the temperature actually fell to 60°, showing that the steam was wholly condensed within 21 yards from the injector, and immediately the steam was shut off, the temperature again rose to 60·5°.

I was desirous of finding out the actual detail of the wave as made, and the effect on the district; but the ordinary recorder was too slow for such information. I therefore adapted a recorder to make a complete revolution in four minutes, instead of in twenty-four hours; and this gave me what I wanted. The alteration of the speed changed the direction in which the charts revolved; therefore it is necessary to read these from right to left. They are of interest and explain very clearly the nature of the wave.

Chart No. 1 was taken on the main pipe leaving the works, and shows two separate records, the lower one being a wave of three minutes duration, and the upper one of five minutes. Chart No. 2 was taken at a point out in the district, and compares very favourably with those taken at the works. I might mention that the tenth rise and fall at the start and finish of each record is caused by the opening and closing of the gas-valve. No trace of the action of the station governor is seen. These records were taken under ordinary circumstances; and the operator depends on a dead-beat gauge for indicating his actions. Chart No. 3 shows the nature of a pressure-wave made by allowing the holder pressure on the district by means of a slow acting bye-pass valve. It was taken at a point in the district.

I might now mention some of the outstanding features of the device as a means of creating a pressure-wave. It has simplicity of working, and is free from governors or any working parts, while it can be installed very easily, and with little cost. It is suitable for the smallest as well as the larger works, and can be operated by any pressure of steam from 5 lbs. per square inch upwards, while the quantity of steam required is negligible.

I have so far referred only to the creating of pressure waves, but I hold the opinion that there are greater possibilities within the scope of this device; and I would like to refer to some of them. Take the case of a works with a two-lift gasholder, the top lift giving 3 inches pressure, and the second lift cupped on, giving 6 inches pressure. During the few hours of maximum output requiring (say) 4 inches pressure, the holder must be kept on the second lift, with the result that all the available retort power is required then, while the remainder of the twenty-four hours the retorts may have to hang. It would seem then that the first lift is of little value so far as pressure is concerned; and to make it useful would relieve the anxiety of some responsible party, as well as making better use of an expensive piece of plant.

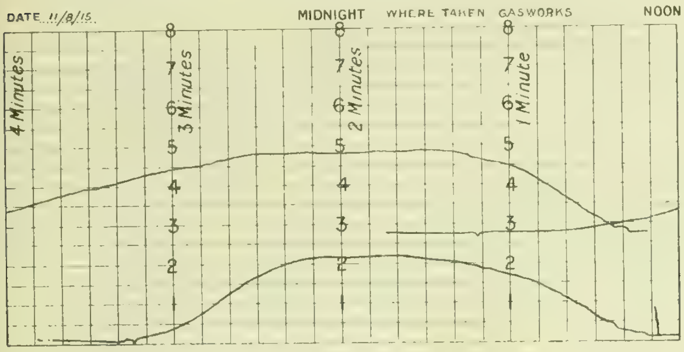


Chart No. 1.

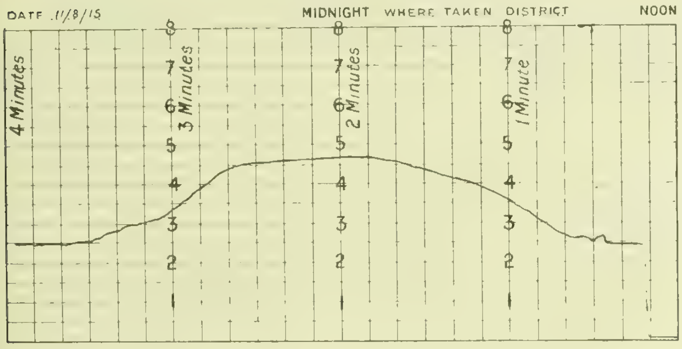


Chart No. 2.

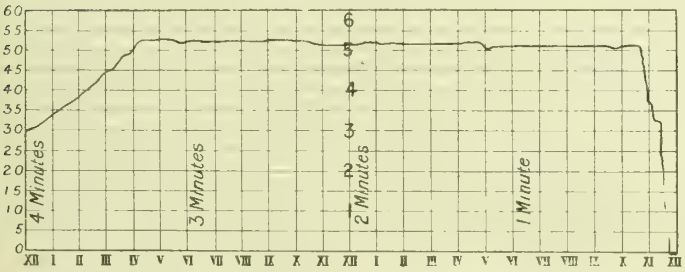


Chart No. 3.

The steam device would serve the purpose very well, and could be fitted in between the gasholder and the station governor. Then just previous to the holder uncupping it could be put into operation, when the gas would be drawn from the first lift and discharged into the governor inlet at sufficient pressure, and would be controlled in the usual way. Even if desired, the steam-valve could be automatically controlled by the governor outlet pressure with the steam-regulator arrangement fitted to the exhausters. Then it is quite possible for the district gasholder to be filled by means of the device.

Another use to which the device could be put is that of testing new main pipes, with either air or gas. A reasonable pressure could be obtained for this purpose; while for district work of this kind, it would be an easy matter to obtain the necessary steam by means of a small portable gas-heated boiler, which generates steam very quickly.

Another use—and a very good one, I think—is that of stand-by or temporary booster in pressure-raising installations. There is always a time when it is desirable, or even necessary, to stop the plant to effect some petty repairs or cleaning; and, in the absence of duplicate plant, this work has generally to be done at very unusual hours, and sometimes at great inconvenience to the district supplied.

DISCUSSION.

Mr. S. B. Langlands (Glasgow) congratulated the author upon his paper. It seemed to him (Mr. Langlands) that the paper was descriptive of a method by which an old exhauster could be put to a new use. There was much ingenuity displayed in thus putting an old thing to a new use; and it appeared to him that Mr. Scott had succeeded in doing this admirably. His contribution was a very lucid one—a valuable addition to the literature of the Association.

Mr. David Robertson (Dunoon) said the device seemed to be suitable for small gas-works; but he should like to have the author's views as to how it would apply as a means of raising pressure in a 12-inch main covering a district (say) ten miles long?

Mr. Alex. Masterton (Edinburgh) said that, in order to form a correct opinion of the device described, he should like to know what system of pressure controllers was installed in the lamps, and if the pressure required to be raised both for lighting and extinguishing. Also what was the nature of the increase required; how far was the pressure-wave travelling; the increase at the end of the travel; and if wet meters or chandeliers were used in the district?

Mr. Scott, in reply, said his service merely consisted of a simple application of steam to a purpose which he was anxious to have served. The question had been asked, if the arrangement was suitable for adaptation to larger-sized works; and his reply was that he saw nothing to hinder it being used for any size of gas-works. At Burntisland, it was feeding a 12-inch main-pipe; and the supply there was very satisfactory. He had no wet meters or water chandeliers in the district, which was an entirely new one. They had nothing but dry meters in use. He was glad that the paper had created some interest.

GAS MEASUREMENT: PAST, PRESENT, AND FUTURE.

By William Gordon, of Edinburgh.

As an official appointed by the Magistrates of the City of Edinburgh to administer the Sales of Gas Act, and whose duties are under the supervision of the Standards Department of the Board of Trade, I felt rather reluctant to submit a paper to a gathering of gas managers. On considering the matter, however, I came to the conclusion that it was really in the interest of the seller and consumer of gas that as much publicity as possible should be given to the important subject of gas measurement. The greater knowledge one gets of the scientific methods employed to secure absolute exactness in meter-testing, the greater confidence will be produced between the seller and consumer of coal gas; and it is an undeniable fact that gas authorities are as deeply interested in having correct measuring instruments as are the consumers.

Past.

In the early days of the distribution of coal gas, the only method of estimating the quantity consumed was by the haphazard one of "computation." This system necessitated charging the consumer a rent for a certain number of burners on the supposition that they consumed a given quantity per hour and were used daily for a stipulated number of hours. The following table of charges will no doubt be of interest to present-day gas managers.

Gas and Coke Company (1814). *Reduced Scale of Charges for Seven Days Burning One Twelve-Hole Argand or Batswing Burner.*

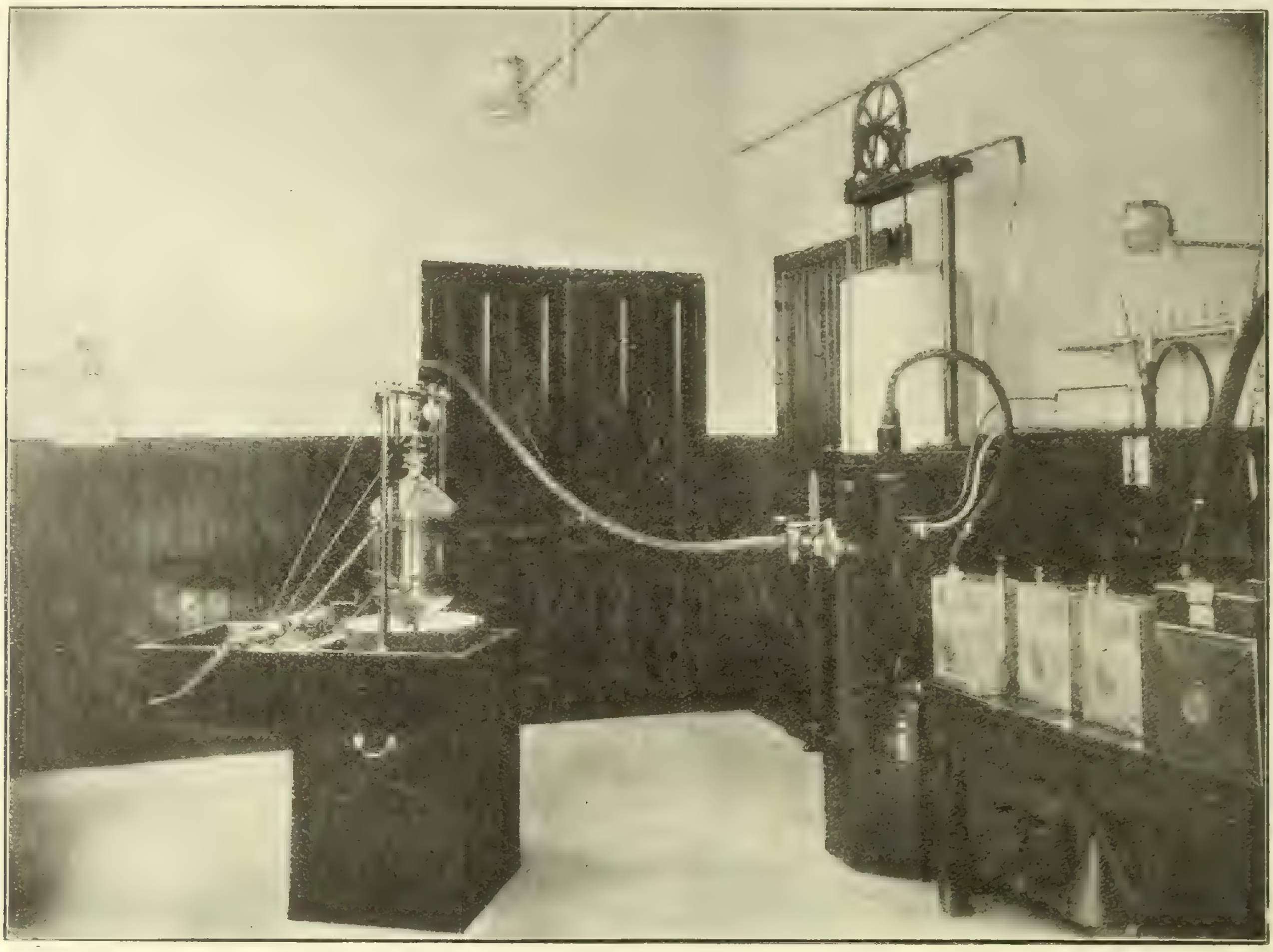
Time of Burning from Sunset to	Per Annum.			Winter Quarter.			Summer Quarter.	
	£	s.	d.	£	s.	d.	s.	d.
9 o'clock	2	8	0	0	16	0	8	0
10 ,, ...	3	0	0	1	1	0	9	0
11 ,, ...	3	10	0	1	3	0	12	0
12 ,, ...	4	0	0	1	6	0	14	0

One hour extra allowed on Saturday nights.

The above arrangement led to considerable confusion, and no doubt opaque window blinds would be in great demand to hide the fact that gas users had not extinguished their jets at the time arranged, and also to prevent spying gas officials reporting same. At this period there were innumerable conditions laid down by the suppliers of gas—one of these being: "The consumer can only receive gas when the mains are charged with gas." I am afraid the gas-using public of to-day would have strenuous objections to such a clause being inserted in their contracts. This method of charging led to many abuses, which necessitated the suppliers of gas charging a price which would indemnify them; and the honest consumer had not only to pay for his consumption but to contribute towards that of his dishonest neighbour. About this time several instruments were invented attempting registration; but the majority of the appliances were much too complicated to be commercially successful. The cubic foot had been adopted by the gas companies as the unit of measurement; but no official certification of its exactness could be obtained.

Early Days of the Gas-Meter.

To those concerned in the progress and development of gas, it soon became evident that if some instrument could be devised



STANDARD CUBIC FOOT BOTTLE IN USE.

by which the new illuminant could be sold by measure, instead of by "computation," its use would be greatly extended. With the necessity came the man; and in 1815 Mr. Samuel Clegg, of London, invented the first instrument for measuring gas, in the form of a wet meter. Its adoption did not, however, become general until a few years later.

Clegg's 1815 meter was considerably improved by James Malam, and again by Samuel Crosley, whose principle of construction was in general use till Mr. Warner, of South Shields, and Mr. Cowan, of Edinburgh, brought the consumer's wet meter up to a stage of accuracy, from an engineering point of view, by the introduction of a cylinder with a compensating arrangement.

The first record of a dry meter occurs in the patent of James Malam in 1820. The specification showed six pairs of bellows radiating from a hollow shaft, through which the gas is allowed to enter and be expelled from each pair in succession by slits and valves.

From this time down to 1833 no attention seems to have been devoted to the dry meter, and the wet meter held full sway. In that year, however, another type of dry meter was introduced. This was at first a very crude piece of mechanism; but after going through a series of improvements, it was, in its altered form, considered a fairly accurate instrument.

The time at my disposal will hardly allow me to give an account of developments and improvements carried out in gas measuring instruments at this period; but no doubt the subject would make an interesting paper for some future date.

The gas-meter continued, in the face of much opposition, to make progress; and at this time (1857) there were a considerable number of meters of both types in use. Repeated and rather bitter controversies continued to arise, however, as to the accuracy of the gas-meter; and one instance is mentioned where a maker is reported to have stated "that his meters were much better than his rivals' because they were constructed to register more than double the quantity of gas consumed."

THE SALE OF GAS ACT.

Complaints continued, and became so frequent as to endanger the large pecuniary interests involved; and the numerous companies, with a view to promoting justice and ensuring exactness of registration in gas-meters, welcomed the introduction into Parliament of the "Sale of Gas Act." The Act met with practically no opposition, and received the Royal Assent on Aug. 13, 1859. Experience in the carrying out of the Act led to the introduction of several amendments, which were added in 1860 and 1864.

The Legislature decided to adopt the cubic foot as the unit of measurement for coal gas; and I do not hesitate to say that, even at this time, it would puzzle not a few of our engineers to determine practically what is a cubic foot. The business of preparing this standard measure was no easy one; and the task was confided by the Commissioners of Her Majesty's Government to Professor Airey, the Astronomer Royal, and to Professor Miller, of Cambridge. The duty of constructing the new instrument was entrusted to Messrs. Ladd, of London. A definite volume or bulk—a cubic foot—of an aëriform nature had to be measured with the utmost accuracy. The substance to be dealt with is invisible, highly elastic, varying in bulk with every change in atmospheric pressure or temperature, possessed of a very complex chemical constitution, and liable to be partially absorbed by water. No expense was spared on the work; and the successful construction of this instrument established the unit of gas measurement.

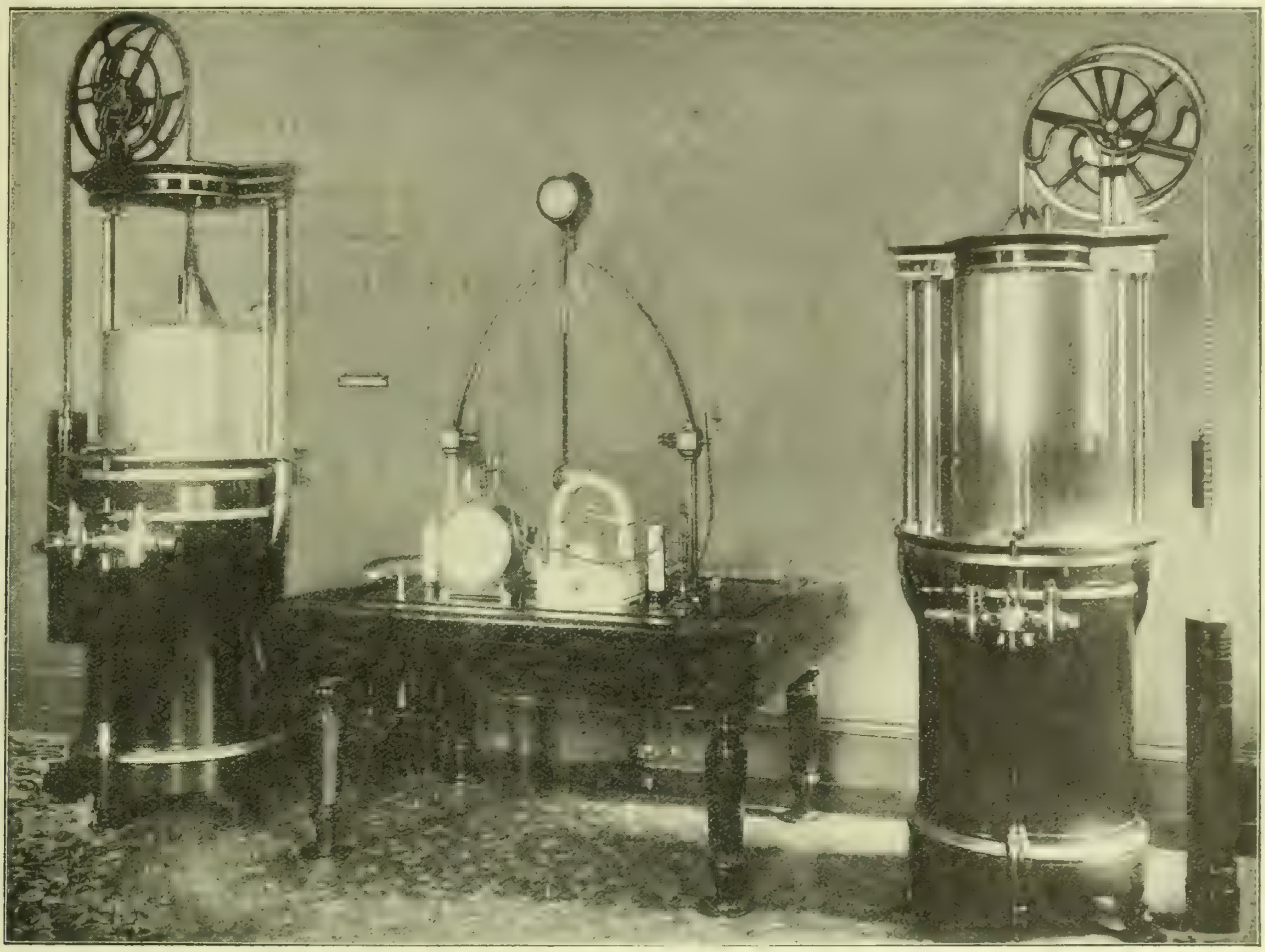
The completed measure is a copper vessel or bottle, in shape a cylinder of 12 inches external diameter with a cone at each end. The cylinder is strengthened with a brass belt at the top and bottom. The measure is constructed to contain 62·321 lbs. weight of pure distilled water; this being the legal weight of a cubic foot of water at the temperature of 62° Fahr., the barometer being at 30 inches. The weight of the bottle slightly exceeds 25 lbs.

Although three standard instruments were constructed—for use in London, Dublin, and Edinburgh—the cubic foot bottle marked "City of Edinburgh No. 3" was retained in London until a few years ago, when, through the courtesy of Major P. A. MacMahon, F.R.S., the Deputy Warden of the Standards, the Edinburgh Gas-Meter Testing Department were granted the custody of the instrument, which I am pleased to have the pleasure of showing you this afternoon.

The apparatus for filling the bottle with water, and thereby displacing into the gasholder the equivalent quantity of air was devised by Mr. George Glover; and the completed instrument is only in a few details different from Mr. Glover's original specifications. In working the instrument the cistern is raised steadily, without the water being agitated, until the water reaches the small orifice which can be distinctly seen through the two discs of plate glass which are specially fitted, and are air-tight. It will readily be recognized that extraordinary exactness can be attained, as the orifice, which defines the exclusion of one cubic foot of air by the water, is only ¼ inch in diameter; whereas the holders which the operator is called upon to verify are respectively about 20 and 25 inches in diameter.

The next step in the measurement of gas was the procuring of standard gasholders to serve the double purpose of holding and registering with exactness one charge or several charges of the cubic foot bottle, and, further, of affording the facility of sending their contents through the gas-meters to be officially tested by their means. Standards of a capacity of one, five, and ten cubic feet were constructed by Messrs. Donkin, of London, under the direction of Professor Airey, who entrusted the superintendence of their construction to Mr. George Glover. A few of the principal features in the construction of these handsome instruments may be mentioned.

(1) That the cylinders should be composed of an anti-corrosive metal, capable of resisting the chemical action of the constituents of coal gas and water.



FIVE AND TEN CUBIC FEET GOVERNMENT STANDARD MODELS.

(2) That the surface of the bell should readily part with the water with which it comes in contact during the measuring operations.

(3) That the bell should be correctly balanced, and that a part of the counterpoise, suspended by a cord passing over a spiral, should preserve the equipoise of the bell at the various depths of its immersion in the water of the tank.

The alloy of which the bells are made is sufficiently malleable to allow of its being wrapped round a truly cylindrical mandril, and sufficiently ductile to permit the sheet lapped on the mandril to be drawn through a strong steel collar, by which it is elongated; the surface during this operation being unbroken and highly polished. In soldering the seam after the sheet was rolled on the mandril, a special method was adopted by which, when it had passed through the steel collar, it came out a perfect tube—it being impossible to discover where the joining had been.

The completed standard models have been reported by scientists to be as accurate as it was possible for human skill to make them, and being to all intents and purposes perfect. Another authority has described the models "as a pleasure to the scientific mind to contemplate." Personally, I am confident that no other country in the world possesses gas measuring instruments of equal accuracy, facility of working, or beauty of construction. The one-cubic foot standard, a copy of which we have before us, is precisely similar in form to the five-feet and ten-feet standards which are deposited in the City Chambers. The scales of the one-foot holder are divided into tenths, hundredths, and five-hundredths of a cubic foot. The Edinburgh Corporation value the standard models so highly—there are only four sets in Great Britain and Ireland—that an insurance policy for a very large sum is effected upon them.

The knowledge that reliable instruments had been constructed which definitely allowed official inspectors to decide the vexed question of accurate measurement, gave an impetus to the gas industry, and to a great extent disarmed the adverse criticism which had been directed towards the gas-meter. It also gave greater confidence to the buyers and sellers of gas, and, consequently, the meter became more popular as a measuring instrument. By the year 1862 the new Act was fairly under way, and fully 100 working gasholders had been verified from the standards for the purpose of measuring the registration of gas-meters. The maximum error allowed on working gasholders is 0·0125 cubic foot on 5 feet in excess or deficiency, and 0·025 cubic foot on 10 feet, in excess or deficiency. These working holders are practically identical in construction with the Government standards, but are not so expensively and elaborately fitted.

First Meter Test in Edinburgh.

In Edinburgh, the first gas-meter was officially tested, found correct, and stamped on Sept. 16, 1861. During the first twelve months 37,605 meters were examined. Of these, 35,923 were wet meters and 1682 dry ones; and 234 wet and 68 dry meters were rejected as incorrect. It may be assumed that a considerable proportion of these meters would probably be submitted for verification, so as to meet the requirements of the new Act.

Present.

During the years 1861 to 1891, of the meters examined by the Edinburgh Testing Department, the wet type was considerably in the majority. In the year 1891-2, however, the dry meter took the lead; and at the present time the proportion of meters submitted to us for examination is, approximately, five and a half dry meters to one wet meter. In the following table it is interesting to note the progress of the number of meters presented for test.

Period.	Dry Meters.	Wet Meters.	Total.
1861-1871	56,534	289,032	345,566
1871-1881	131,241	249,467	380,708
1881-1891	176,921	179,823	356,744
1891-1901	392,220	168,136	560,356
1901-1911	718,509	157,675	876,184
1911-1912	83,114	15,004	98,118
1912-1913	78,759	11,971	90,730
1913-1914	76,825	13,572	90,397
	1,714,123	1,084,680	2,798,803

The number of meters rejected for incorrectness is exceedingly low. For the past three years the figures are:—

	Total.	Rejected.	Per Cent.
Dry meters	238,694	1,744	0·73
Wet meters	40,547	101	0·24

It should be mentioned that fully 99 per cent. of the old meters submitted for certificate test are of the dry type. The fees drawn since the institution of the department amount to £81,555.

A short time ago an eminent gas engineer invited me to carry out a number of experimental tests for accuracy of measurement

Pressure.	Consumption.	Result.	
		Fast.	Slow.
Inches.		Per Cent.	
0·5	Restricted 30 cubic feet per hour.	1·01	—
1·0		1·01	—
1·5		1·01	—
2·0		1·01	—
2·5		1·01	—
3·0		1·01	—
3·5		1·01	—
4·0		1·01	—

Temperature of gas in holder and meter, 59° Fahr.

on a 5-light dry meter. The meter had been delivered at his works along with a consignment, and was taken at random from the stores. My instructions were "to test the meter not under the Sales of Gas Act, but at pressures varying from 0·5 inch to 4 inches." [The result of the test is given at the foot of the previous page.]

As it has sometimes been asserted that a sudden increase of pressure in the mains, and, consequently, at the point of ignition—if ungoverned—has a tendency to cause a meter to register incorrectly while passing the increased quantity, we, with a view to ascertaining the effect of varying pressures on the above meter, made further tests the particulars of which are:

Pressure.	Consumption per Hour.	Result.	
		Fast.	Slow.
Inches.	Cubic Feet.	Per Cent.	
0·5	30	1·01	
1·0	43	Net	
1·5	51	Net	
2·0	60	Net	
2·5	68	Net	
3·0	75	Net	

Temperature of gas in holder and meter, 59° Fahr.

The preceding figures clearly prove that the gas-meter has now attained a high stage of exactness; and this fact is more remarkable when it is recognized that no mechanical instrument receives, and really requires, so little attention, and does its work so easily and so satisfactorily as the gas-meter. Still greater confidence could yet be given to the public if a system of periodical re-verification of the gas-meter could be arranged—say, at the expiration of ten years from the date of manufacture, or from the previous re-verification.

INDEX TESTING.

The question of a separate test for gas-meter indices has been under consideration for some time. The subject may, in the early days of gas-meters, have been of importance; but the extraordinary care now shown in the manufacture of meter mechanism greatly minimizes the necessity of interference by the Legislature. Present-day gas consumers have shown no anxiety to have the indices of their meters tested separately. The expenditure incurred in carrying out such a test would be very large; and the benefit gained by the consumers—who would have to pay for the innovation—would be infinitesimal. It should be borne in mind by those who from time to time advocate the laying down of special plant for testing indices, that gas is the only illuminant supplied to consumers through instruments which are officially tested for accuracy under conditions as prescribed by Act of Parliament. So much cannot be said for the rival illuminant.

FUTURE.

Restricted lighting regulations, to meet the requirements of the moment, have had the effect of interfering with the progress of the use of high-pressure gas for lighting. Consequently, the subject of making provision for officially testing meters which are constructed to register the consumption of gas under pressure has been somewhat retarded.

HIGH-PRESSURE METER-TESTING.

To test a high-pressure meter under the existing conditions, as prescribed by the 1859 Act, is of practically no value; and, so far as I am aware, no apparatus has yet been devised which can be used for testing high-pressure meters for accuracy of measurement at varying pressures. The Standards Department of the Board of Trade have been considering the question; but up to the present time no instructions have been issued to Official Inspectors.

It can readily be understood that gas distributed at high-pressure is a complete revolution to the existing low-pressure system when it is explained that the ordinary meter is constructed for use with gas delivered at an average pressure of 2 inches water-gauge, or 0·072 lb. per square inch; a high-pressure meter must be designed for use with gas distributed at a pressure of 80 inches water-gauge, or 2·88 lbs. per square inch and upwards.

The volume of gas varies very considerably under compression, and 1000 cubic feet at atmospheric pressure becomes, approximately:

891	cubic feet at	50	inches pressure.
836	,, ...	80	,, ,,
812	,, ...	100	,, ,,
500	,, ...	407	,, ,,

There is one point in connection with the distribution of high-pressure gas to which I would venture to draw your attention; and that is the advisability of gas managers deciding upon a definite maximum pressure for distribution purposes. Though the new illuminant has made rapid strides, I feel confident in saying it is still in its infancy; and if a uniform pressure were agreed upon, this would enable the suppliers of the necessary apparatus to standardize their wares. Consequently, the cost of production of these articles would be considerably reduced; and difficulties regarding maintenance, replacements, and storage would thus be minimized.

The question of designing apparatus for accurately testing high-pressure meters is an extremely complex one, and worthy of the attention of gas engineers. We may have an instance of "history repeating itself," and Parliament appointing experts for the purpose of constructing machinery to meet the new requirements; and should those to whom the task is entrusted be as successful as the scientists of 1861, they will, I am sure, not only earn the gratitude of those concerned in the sale of gas, but of the general public.

[The report of the discussion to which the paper gave rise will appear next week.]

TRAINING AND EDUCATION OF GAS-FITTERS.

By R. W. Cowie, of Dalkeith.

At our annual meetings we almost invariably discuss matters concerning various types of plant for the most economical and efficient production, purification, and distribution of our products; but there seems no reason why we should not also discuss how we can enable our gas-fitters to become more efficient and expert in their various duties, and more conversant with the construction, working, and regulating of the various gas appliances now on the market, so that we may be able to interest and satisfy our consumers in the utilization of gas for the manifold purposes to which it is adapted, and thereby increase our output by making gas indispensable to the general public.

To some of you it may appear out of date for this subject to be brought up and discussed here after what has already been said at the various Association meetings—particularly the Institution of Gas Engineers—and written in the Technical Press. To others, it may seem that the gas-fitters have had too much attention paid to them, and may in consequence become somewhat conceited and attain an undue sense of their own importance. But I trust that all present will agree that there is considerable scope for the better education and training of gas-fitters, and that this branch of our business has been too long overlooked.

So far as I can remember, our Association has not at any of the annual meetings had this subject directly under consideration; and my object to-day is not to lay before you anything new in this direction which has been accomplished in my own town, but simply to introduce, for full and free discussion, a matter of more than a little importance at the present time. It is a subject on which one is tempted to dwell; but I hope to err rather on the side of brevity.

THE OLD CONDITIONS AND THE NEW.

The work of the gas-fitter now-a-days is entirely different from what it was a number of years ago when flat-flame burners were most common, and gas-fires, gas-cookers, gas-irons, &c., were conspicuous by their absence. At that early period it was quite possible for a man to be a plumber, gas-fitter, sanitary and electrical engineer, bellhanger, &c., all in one; but to-day, from the gas engineer's point of view at least, gas-fitting embraces such a wide field of work and science that it can well stand alone as a distinct trade.

The field for the extension of the uses of gas is a very large one indeed, and the ideal of a gas-cooker and water-heater in the kitchen of every house, and gas-fires in the principal rooms, is yet some way off. In this direction, however, manufacturers of gas-consuming apparatus are doing valuable work by perfecting their various manufactures, making them simple in construction, more efficient as regards economy in the use of gas, more in accordance with the requirements of hygiene and cheapness in working. So long, however, as science and skill, along with man's inventive genius, are applied in the direction of gas heating, lighting, and power, so long will there be improvements and inventions, all of which will consolidate the already strong position of the gas industry.

The gas-fitter of to-day thus finds himself confronted with the duty of keeping himself constantly in touch with the latest devices in connection with which gas is utilized, and the best methods of fixing, adjusting, and working these appliances. It is, therefore, the duty of every gas engineer and manager to see that his staff of fitters, inspectors, and foremen is trained in such a way that the men may be able to deal effectively with any inquiry or complaint received from gas consumers.

As in the past, so will there be in the future some young men who have a wider outlook than others—who are keener to master the details of their work with a view of advancing themselves in their profession. In spite of many difficulties in the way of more full and complete technical education, such men invariably attain their object. On the other hand, there will always be "hewers of wood and drawers of water;" and the majority of young men entering the gas-fitting trade will remain gas-fitters. There is, nevertheless, reason for them to be proud of being such. It is imperative they should be trained; and the duty of every employer is to see that they are trained as well as possible—practically and theoretically; so that their work, besides insuring them their daily bread, may also be a source of pleasure because of their interest in it.

While studying this question, it is well to remember that the gas-fitters in large towns are in quite a different position from those in smaller towns and works. In the former, where there are large works, it is a comparatively simple matter to arrange special classes, either separate from, or in conjunction with, the School Board evening classes or technical schools, and to thus encourage young fitters to attend these classes, when they can readily sit for the City and Guilds Examinations as well as the class examinations. Again, large gas undertakings can often procure the assistance of the technical experts of the various manufacturers of gas apparatus, who send them, free of charge, to deliver lectures and give demonstrations, setting forth their special features in construction, regulating, fitting, working, &c. It has been my privilege to attend some of these lectures in the City of Edinburgh, from which I derived much benefit.

Educational Work in Edinburgh.

I have been favoured by our esteemed Vice-President, Mr. Masterton, with particulars of the Edinburgh and Leith Gas Commissioners' scheme for the education and training of gas-fitters, along with the conditions attached to same; and I have pleasure in submitting it here for your consideration.

Boys, generally from 14 to 15 years of age, who apply for engagement as apprentices in the Gas-Fitting Department are interviewed, and their general physical appearance is noted and their eyesight roughly tested. They are asked a few questions as to general health, fondness for exercise, reading, study, &c., and a note of the general results of schooling. Thereafter they are set simple papers in arithmetic, consisting of four sums, one each in simple and compound multiplication, one in decimals, and one in proportion. They are also required to copy out a short paragraph from one of the daily papers or from a technical book, to note their handwriting and accuracy of observation. If they pass this examination satisfactorily, they are sent to the doctor for examination; and if they are passed as sound and healthy, they are taken on and started in one of the show-rooms for about nine to twelve months.

When they are about to leave the show-rooms (which occurs when there is a vacancy in the workshop), they make application in a given form which it is stipulated they should copy in their own handwriting and sign. In this application they state their agreement to the conditions of service which are attached, and which include attendance at the School Board evening continuation classes and the Heriot Watt College for the following subjects: Building construction, mathematics, gas-fitting, plumber work, and other handicraft classes as may be arranged. The parent's signature, as well as that of the applicant, is required both to the application and to the conditions. The papers are afterwards accepted and signed by the Engineer and stamped at the Inland Revenue.

It is almost unnecessary to mention that in every system of this kind there should be careful observation of the personal element. Each year as the winter season comes round the lads at Edinburgh and Leith are addressed by the Engineer, and also by a representative from the Educational Committee, and the advantages of, and facilities for, evening instruction brought clearly before them. Some of the lads who are rather young or a little backward in their general education are advised to take classes in English, arithmetic, and drawing during their first year, and practical mathematics and geometrical drawing for the second year. Others more advanced are sent at once to the continuation classes to study building construction and drawing, plumbers' and gas-fitters' practical and theoretical work, workshop arithmetic and geometry, for the first and second years.

After this, they attend the Heriot Watt College for advanced plumber work, theoretical and practical, or a special gas-fitting class arranged by the Board, and finally advanced physics connected with the gas-fitting and plumbing. They have also now to attend a special class arranged by the School Board in gas lighting and appliances at the evening continuation classes in two courses, elementary and advanced.

Monetary Encouragement.

As an encouragement to the lads to prosecute their studies with intelligence and vigour, a payment of 6d. per week is given for the junior and 1s. per week for the senior, for each class certificate gained. The highest wages earned last year by an apprentice in his final year was 19s. 6d. per week—18s. being the regular pay, and three additional sixpences gained for junior certificates at classes. These classes in Edinburgh, as in other centres, as you will readily understand, have been greatly interfered with by the war, and also by the great bulk of the lads joining the Army. However, this seems to provide an opportunity for them to look into the matter and put their house in order, and when the war is over to enter afresh into this necessary work.

Educational Methods in Small Towns.

In the smaller towns it is equally necessary that the gas-fitter be quite as capable as his compeer in the city; yet it is manifestly out of the question for the same procedure to be adopted in his training and education. Gas consumers in small towns are quite as particular with regard to their domestic gas supplies, and the same taste and skill are required for the fixing of gas fires and cookers and every other form of gas consuming apparatus.

It is not sufficient that the fitter be able to lead a pipe from the meter or the main supply in a house to a bedroom or other room and connect it up to a fire; he ought to be able to know how to overcome the hundred-and-one little difficulties which continually crop-up in the course of his work, and be able to give the lady of the house perfect satisfaction, information, and instruction as to the proper use and control of the apparatus. A gas-fitter so capable will not require to be continually followed up in the large towns by inspectors, and in the smaller towns by the managers and their assistants. Considerable economy will therefore ensue; and the manager will be able to devote his time to other more important objects.

How, then, are we to assist the gas-fitter to gain the required knowledge and experience? In the first place, we ought to insist on all apprentices attending continuation classes, even though there is no private arrangement between the School Board and the Gas Department, as mentioned in the case of Edinburgh. We should likewise take an interest in the lads, and see that they get opportunities of acquiring an insight into the construction and working of various appliances in use, and follow up and keep a record of their class progress as well as the results of their various examinations.

City and Guilds Examinations.

It is just here where the benefits of the City and Guilds examinations come in, as they form a goal for the gas-fitter to work up to. After very careful consideration, much thought, planning, and arranging, the Institution of Gas Engineers have been able to get an examination for gas-fitters introduced into the syllabus of the City and Guilds of London Institute; and this year saw the first of these. One was held in Glasgow in February of this year; but there is no reason why it should not also be held in other centres, if sufficient numbers come forward. I understand from the examiners that the examination was considered quite as successful as could have been expected the first year.

The examinations as you will no doubt know are in three grades. Grade I. is a written examination only, and no certificates are awarded for successfully passing it, though it qualifies for sitting for the examinations in Grade II.

Pass certificates are awarded in Grade II. when candidates have passed both practical and written examinations; the written one following the practical one, and only those who have passed the practical test being allowed to sit for the written examination. Candidates for the final examination must hold a certificate for Grade II. or (until after the examination of 1916) must have served at least four years' apprenticeship to the trade.

This final examination is similar to Grade II., only the practical test is more difficult and the written examination demands a wider sphere of knowledge. First and second class certificates are awarded on the results of this examination.

Our young gas-fitters should be well encouraged to try these examinations and helped in their preparations for them. There must be few towns in Scotland where the continuation classes do not comprise classes for apprentice plumbers and gas-fitters, in which they can get theoretical training and general education which will enable them to express in writing what they really know of their work, and give the answers to questions set at the examinations. As Mr. Halkett pointed out in his report of the examination in Glasgow, this inability to express themselves in words was one of the principal weak points.

Correspondence classes on the subject are of great value, particularly where there are no suitable evening classes. This method of tutoring has its disadvantages; but it possesses this great advantage in giving the student much practice in writing out answers to questions, and in making him study and work. These classes are somewhat costly; but the gas undertaking where the fitter is employed ought to give some monetary assistance, especially on a successful completion of his studies by the passing of the examination.

Skilled Workers and Certificates.

There are throughout the country many capable men of wide experience who are well up in their trade as gas-fitters, and could be entrusted with work requiring skill, accuracy, and taste, and yet could never face the ordeal of a written examination. The Institution of Gas Engineers very wisely introduced a scheme whereby such men over 35 years of age may become certificated gas-fitters, and thus save them from being envious of their younger workmates, who, though they might be able to pass the required examination, are yet not their equals in practical knowledge and experience.

Particulars of this scheme have been circulated through all the gas undertakings in the country; and it remains for gas-fitters to make application and managers faithfully to fill up the forms, and, if the fitter is qualified, to see that he gets his certificate. This certificate can scarcely rank with the one granted by the City and Guilds of London Institute, and it is well that this scheme is only a temporary arrangement, and that after 1917 all gas-fitters must pass the City and Guilds examination to obtain the certificate.

Value of Technical Journals.

There must be few gas managers who do not get either the "Journal of Gas Lighting" or the "Gas World" paid for them by their companies or corporations, so as to keep them conversant with the latest inventions and obtain current general information of the industry; and I do not see why the companies or corporations cannot likewise provide the gas-fitters with "Gas: Light, Distribution, and Maintenance." This is pre-eminently a gas-fitters' paper, calculated to do an immense amount of good in the way of quietly and steadily educating the gas-fitter who carefully reads the various articles specially written for him; and though he might never sit for an examination, he cannot fail to be a better and more efficient workman through receiving and reading regularly such literature. The possession of a certificate by the gas-fitter may be a source of gratification to him; but the possession of more intelligent gas-fitters, whether they be certificated or not, is of more importance to us as managers, and the small outlay on a weekly journal for them will amply repay itself.

When gas engineers and managers in larger towns are having manufacturers representatives to lecture on their goods—the best methods of fixing and adjusting same, their distinctive features, &c., &c.—it would be a good thing for the managers and their fitters in surrounding towns to receive an intimation of, and invitation to, such lectures, when no doubt they would get new wrinkles on various points and their minds refreshed on others.

[The report of the remarks made by members on the above communication is unavoidably held over.]

CARBONIZING MIXTURES OF COAL AND COAL DUST.

In a recent number of "Het Gas," Heer D. T. Ross van Lennep, the Chief Chemist at the coal mines of the Dutch Government, dealt with the subject of economizing gas coal by the admixture with it of fine coal dust before carbonization. As the plant at the mines was not in working order, the experiments were carried out at the Hague Gas-Works; and the author furnished the following particulars in regard to them.

The coal dust came from the Wilhelmina Mine; and for carbonization the ordinary horizontal retort was used. Three series of experiments were made—one (A) with dust alone, another (B) with a mixture of 80 per cent. of Easington gas coal and 20 per cent. of dust, and the third (C) with the coal alone. The following were the results:

	A.	B.	C.
Gas produced per metric ton . .	8050 cub. ft.	11,550 cub. ft.	11,326 cub. ft.
Calorific power per cubic foot .	464 B.Th.U.	554 B.Th.U.	578 B.Th.U.
Suiphur in purified gas . . .	0·15 grain	—	—
Appearance of coke. . . .	powder non-caked	good caked	very good
Duration of carbonization . .	4 hrs. 48 min.	4 hrs. 48 min.	4 hrs. 48 min.

These results show that from a mixture of 80 per cent. of gas coal and 20 per cent. of fine dust a sufficient quantity of gas and a coke of good quality can be produced. The following is an analysis of the coal:

	Per Cent.	
Moisture	12·00	
Volatile matter.	11·34	in dried coal.
Coke	88·66	
Ash	8·17	

In the process of destructive distillation there were produced per metric ton of dried coal 4·2 kilos. (9¼ lbs.) of tar and 3·4 kilos. (7 lbs.) of sulphate of ammonia. The composition of the gas (sp. gr. ·20) was as follows:

	Per Cent.		Per Cent.
Co_2	3·1	H_2	70·9
C_nH_m	0·2	CH_4	17·3
CO	4·1	N_2	4·4

The author remarked that it might be a somewhat peculiar idea to carbonize poor coal containing 10 or 11 per cent. of volatile matter for the production of gas. But he pointed out that this is very often done, and that its admixture with a better kind of caking coal produces coke of good quality; the caking properties of the coal causing the incrustation of the dust. The coke is better caked, less porous, and of greater resistance; and the gas has a higher calorific power than might have been expected from the carbonization of the mixture. This phenomenon is generally observed in the carbonization processes carried on in coke-ovens; and the cause is to be found in the production of a considerable quantity of gas of low calorific power (446 B.Th.U.), and consisting chiefly of hydrogen. This poor gas dilutes the richer quality of that coming from the gas coal, and protects the hydrocarbons against decomposition. It is also of some interest to note that the distillation period for the mixtures containing poor coals is shorter than that for gas coals only. This fact is due to these coals requiring less heat for their distillation, and moreover they have higher heat-conducting power, so that the heat is transmitted with greater velocity to the core of the gasifying mass. In the distillation of such heterogeneous combinations, great care should be taken to ensure a thorough mixing of the components. If this should be insufficient, the local larger amount of fine coal dust causes the binding properties of the gas coal to be inadequate, and the coke becomes very brittle and almost unsaleable.

Whenever managers of gas-works purpose making use of lean coal, the utmost care should be taken to ensure perfect mixing; and therefore it will be necessary that the gas coal should be broken to a size of less than half an inch. In the case of those works which are equipped with mechanical coal-handling plant, the installation of special coal-mixing appliances will be a matter of interest.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Dublin Gas Company.

Sir,—As the affairs of this Company will shortly come under the review of the shareholders at the approaching half-yearly meeting, the time is not inopportune to call attention to a few factors relating to the immediate past and their influence on the Company's affairs.

From public records one finds that the gross profits of the concern for the years enumerated are as under:

			Price of Gas.
1910 .	£97,875,	or 15·66d. per 1000 cubic feet ..	3s. 4d.
1911 .	£90,615,	,, 14·91d. ,, ,, ,, ..	3s. 4d.
1912 .	£92,601,	,, 15·14d. ,, ,, ,, ..	3s. 4d.
1913 .	£70,484,	,, 11·89d. ,, ,, ,, ..	3s. 4d. and 3s. 6d.
1914 .	£77,580,	,, 13·38d. ,, ,, ,, ..	3s. 6d.

From this table, it will be seen that the tide has again turned in favour of the Company. The newly-constituted Board have been in actual power for little more than fifteen months. The betterment, therefore, exhibited stands to their credit.

As the Company's affairs, a "technical machine," cannot have become so disjointed and dilapidated suddenly as the finances of the year 1913 revealed, it is reasonable to suggest that the material fall in profits arose primarily through lack of administrative ability; and the period through which the new Board have been in control is more than sufficient to have recovered from this want of administrative and business capacity on the part of the old Board. It is reasonable, therefore, to assume—in fact, it will be seriously disappointing to the shareholders if the half-year's balance-sheet now nearly due does not disclose—a return to the full normal profits at the least, particularly in view of the fact that the Company largely rely on the manufacture of carburetted water gas, so that the high cost of coal will not have been a material hindrance to their prosperity.

In view of the position which the present Board adopted in suppressing the experts' report, shareholders have a right to expect some important communications at the forthcoming meeting. It will be important to know the headings under which the anticipated improvement has been acquired, as distinct from commercial conditions.

It is also very important that the shareholders should be informed of the extent (if any) to which the experts' recommendations, administrative and technical, have been given effect to, and what yet remains to be done. In fact, has the time not arrived when the report might reasonably be circulated among the shareholders—seeing that it would not now affect the credit of the Company, but will be fruitful in allaying much fear and concern as to the Company's future welfare? There should be nothing in the report that the proprietors should not now know; and it is to be hoped that, if the Board show any reluctance to take the shareholders into their confidence, they will be made to do so by the shareholders' vote.

Anticipant.

Sept. 3, 1915.

Radiant Heat Distribution.

Sir,—Your leaderette on the "Distribution of Radiant Heat" claims many advantages for the semi-circular over the straight fronted heating area. It would be better to look for compensations rather than advantages; and they are rather difficult to find.

The straight front—with the radiant energy travelling, of course, in straight lines, but you apparently overlook *in all directions* (not merely at right angles to the front, but sideways)—would effectively warm anyone sitting with the chair on any part of the hearthrug. The radiation unimpeded would strike the side walls of the room a very short distance in front of the line of the gas-fire; no sitter would wish to be behind this line of effective radiation.

The straight front has not been condemned because there is too much heat in the front, so we assume that the semi-circular front would have to give equally as much heat from the front to be effective; to make the sides effective, an increased amount of heat would have to be provided, which means bigger gas bills.

The view at the side would only take in half the heating area; but with the straight front the whole is visible.

One of the reasons why the round-fronted fire has gone out of date (it was all popular at one time) was the difficulty of preventing the products coming into the room every time the slightest draught crossed the front of the fire. It is not possible to protect the front from side draughts, as you can in a straight front.

You will thus see that there are two sides to most questions, including the round-fronted gas-fire (!) which is not new, and is not without defects.

If it were possible to produce radiant energy that would not be subject to the law of inverse squares, the centre of the ceiling would be an ideal place of heating. The heat would be distributed into every corner of the room and not interfere with any of the arrangements as would be the case with central floor heating. We cannot alter the law, as the greatest heat would be at the wrong end of the persons under it.

Jas. W. Wilson
(Wilsons and Mathiesons, Limited.)

Leeds, Sept. 3, 1915.

[A reference to this letter appears in a leaderette paragraph on an earlier page.—Ed. J.G.L.].

Atmospheric Gas-Burners—Patent No. 19,073 of 1914.

Sir,—I am interested in this invention; and the inventors may like to know that I made and used discs such as they described five or six years ago. The Ecliptic people have sold high-pressure burners with such discs. If the inventors will communicate with me I shall be happy to show them any of the various combinations. Mr. Franklin Thorp also knows a good deal about such discs.

Geo. Helps.

Nuneaton, Sept. 3, 1915.

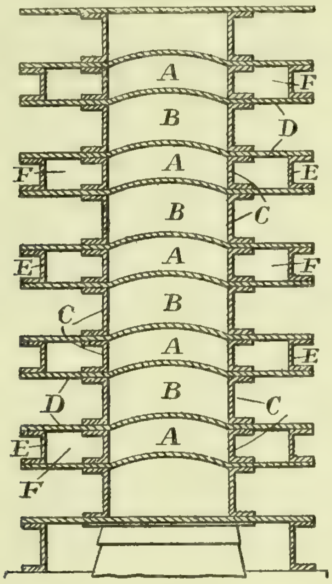
REGISTER OF PATENTS.

Built-up Metal Retorts.

Duckham, A. M'D., of Ashtead, Surrey.

No. 13,935; June 9, 1914.

Retorts according to this invention are constructed of steel or iron plates. They are of the kind which are considerably wider than they are deep, and have their sides substantially vertical and the top and bottom arched to the same curvature. The heating flues alternate with the horizontal or inclined retorts in a vertical column. In this case the column can be built up of channel iron bars or beams having the under surfaces of their webs vertical and so placed that the surfaces form the inner faces of the side walls of the retort and of the flues, while the flanges are bolted to flanges of plates of curved cross section which form the arch tops and bottoms of the retorts and of the flues. The flanges of the curved plates may be laterally extended and bolted at their edges to other channel irons "so as to form chambers alongside of the retorts for the reception of the products of distillation."



Duckham's Built-up Metal Retorts.

Such a construction is illustrated in vertical cross section through a number of horizontal retorts A with interposed heating flues B. The column is built-up of channel irons C alternating with rectangular plates D. The portion of the plate which is within the space enclosed by the channel irons is arched for the purpose named. The edges of the plates are bolted to channel irons E, so that chambers F are formed —one on each side of each retort—in order that the products of carbonization may be collected from outlets in the sides of the retort.

Collecting Gas-Main for Coke-Ovens [Retort Benches].

Still, C., of Recklinghausen, Germany.

No. 14,243; June 13, 1914.

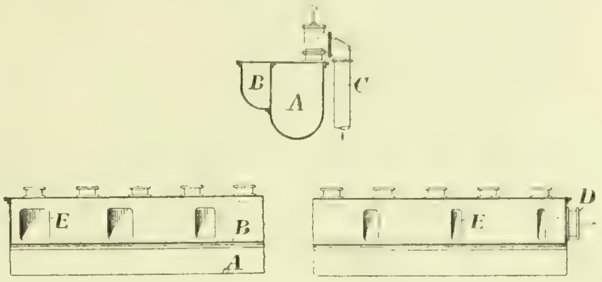
This invention relates to collecting mains for the gases of coke-ovens and the like; the object being "to provide means by which both the pressure at all points in the gas-main extending over the whole length of the oven battery and the suction exerted on all the ovens communicating with the gas-main may be rendered absolutely uniform."

In coke ovens, as usually constructed, the patentee remarks, the gases produced during the coking process are collected in a common receiver—known as the collecting main—extending over the whole oven battery, from which they are exhausted and carried into an adjoining main conduit by suction, which is exerted either in the middle or at the one end of the gas-main. This construction has the disadvantage that the pull on the gases from the different coke-ovens varies according to the position of the latter relatively to the point where the suction is exerted; the intensity of the exhaustion being greater the nearer the oven chamber is situated to this point, and decreasing as the distance becomes greater. Owing to this varying suction, different gas pressures are maintained in the different oven chambers, whereby the tendency of the gases to leak from the oven chambers into the adjacent heating flues, and *vice versâ*, is increased.

The disadvantages named are said to be avoided according to the present invention by providing a special auxiliary gas-main parallel to the collecting gas-main, which latter is connected with the oven chambers by the usual standpipes. The auxiliary main communicates with the collecting main by a series of uniformly distributed openings varying in cross-section in a definite manner, and is itself in connection with the exhausting device which leads the gases away.

A vertical cross-section is given taken through the collecting gas-main and the adjoining auxiliary main; also a vertical longitudinal section through the latter.

The complete gas-main consists of the collecting main proper A and the auxiliary main B side by side with the former. The collecting main, which is closed at both ends, receives the gases from the ovens in the usual way by a number of ascending standpipes C arranged on the individual ovens. The auxiliary gas-main, adjacent to the collecting main, is connected at its one end to the main gas-conduit [not shown] by the pipe D, which leads the gases away to the bye-product plant by the action of any suitable exhausting device. In the partition between the two adjacent mains A and B are a number of openings E, which are uniformly distributed along the whole length of the main, but varying in a definite manner in their dimensions. The opening E, situated nearest to the point D, at which the suction of the gas exhausting device is exerted, must be of the smallest cross-section; while the other openings increase in dimensions as their distance from it increases. By the arrangement of these openings, as described, the distillation gases, entering the collecting main A through the whole series of standpipes C, are exhausted from the main at numerous points distributed along its length into the adjacent auxiliary main B, which leads the gases away in such a manner that very uniform withdrawal of the distillation gases from the different ovens is assured.



Still's Collecting Gas-Main.

This effect is said to be realized by dimensioning, according to a certain rule, the different openings E between the two gas-mains A B in such manner that those situated nearest to the end where the gases are withdrawn, and which are therefore most influenced by the suction, are of the smallest size, and those farther from the first are of a size increasing gradually and exactly inversely proportional to the intensity of suction. The uniform exhaustion of the gases from the whole collecting gas-main, and in consequence also from all the ovens connected therewith, "causes the pull on the different oven chambers to be constant and very small, and to approximate closely to that in the adjacent heating flues, whereby a very good working of the coke-ovens is assured."

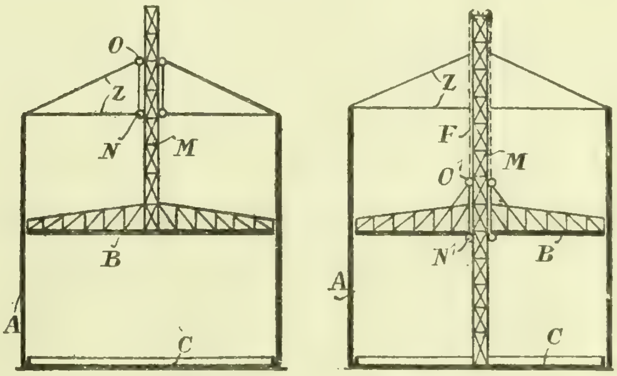
Gasholders (Erection of) with Disc-Shaped Crowns.

Maschinenfabrik Augsburg-Nürnberg A.G., of Nürnberg, Germany.

No. 16,472; July 10, 1914. Convention date, Oct. 25, 1913.

This invention relates to gasholders with disc-shaped crowns described in patent No. 16,184 of 1914, and relates to an improved method of erecting holders of this type.

Such holders may be erected "with the greatest facility," according to this invention, by using the disc which is intended to serve as the crown as a workmen's platform for building-up the rest of the structure —the disc being for the purpose at first movably suspended and constantly drawn higher as the work of erecting proceeds, and is "finished off as a disc-closing member" only after the work has been completed.



Erection of "Nurnberg" Gasholders.

A diagrammatic view is given to show a completed holder erected in accordance with this invention; also a similar view showing the initial stage of erection.

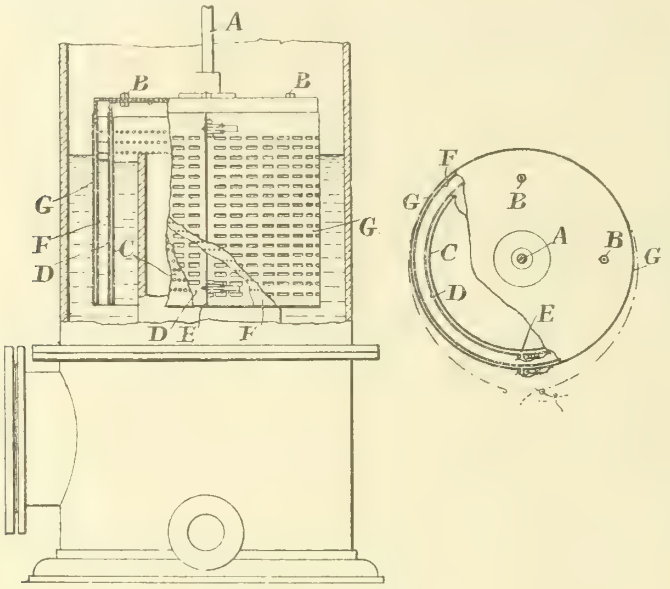
The crown B is guided in a straight line by a column M in a structure Z provided with guide-rollers N. When beginning the work of erection, the supporting framework of the crown B, as well as the column M, consisting of trellis work, is set up on the ground, "without, however, firmly inter-connecting the same." On the contrary, guide-rollers N^1 O^1 serve for guiding the column and the crown, and are secured to the roof truss Z; being temporarily fitted to the framework of B, so that it can be raised by tackle F on the column (which is anchored at the bottom) and, if necessary, also at the top by ropes. The crown, which is thus adjustable at any height, may be used as a staging for the workmen and as a centring or scaffolding for erecting the sides A. "This arrangement has the additional special advantage that the side wall can be adapted with any desired degree of accuracy to the local inaccuracies in the shape of the disc, so that in any vertical position the room for play at the sealing joint is as small as possible."

Tar-Separator.

Berlin-Anhaltische Maschinenbau-Aktien-Gesellschaft, of Dessau, Germany.

No. 16,981 ; July 17, 1914. Convention date, Sept. 5, 1913.

This invention relates to tar-separators the plunger bells of which have tar-separating walls, each comprising two perforated partitions or casings, with the object of facilitating the dismantling of the bell for cleaning purposes. According to the invention, the outer casing of each pair of the tar-separating walls is detachably connected, by means of clamping members or the like, to the cover of the bell and to its inner casing or separating wall.



A "Bamag" Tar-Separator.

The plunger bell of the tar-separator shown is secured to a spindle A. The covers of the double-walled bell are detachably connected by screw bolts B. To the flange of the inner cover is secured the inner casing C of the inner pair of walls. This casing is provided with an outer casing D, which bears at the top against the flange of the inner cover, so that only a small space is left between the two casings. The casing is divided vertically along one edge E, and after being placed round the casing C is held by clamps like "bottle-closing devices."

In the same way, the inner casing F (secured to the flange of the outer cover) is provided with an outer casing G, the upper edge of which is divided vertically and bears against the flange of the outer cover, and is also held together by clamps. The two pairs of walls C, D, F, G are maintained apart by distance-pieces—for instance, studs, wires, or the like.

The fixing of the plates in correct position relatively to each other is facilitated by the outer portions of each wall being made in the form of a single closed casing D or G held fast by clamps ; and when removing the casings, it is merely necessary to open the clamps, when they can be removed at once, as illustrated by dotted lines in the plan.

Purifying Gases containing Ammonia and Sulphuretted Hydrogen and Recovering the Ammonium Salts.

Duvieusart, F., of Santiago de Chili.

No. 17,475 ; July 23, 1914.

This invention relates to a process for removing ammonia and sulphuretted hydrogen from gases, consisting in "treating the gases with an aqueous solution of sulphurous acid, the resulting liquor being treated alternately with sulphurous acid and the gases to be purified ; further treatment with sulphurous acid and the application of heat resulting in the production of sulphate."

According to the invention, the purification of the gases is effected by washing them, either cold or hot, with a solution containing the sulphited organic bases in tar. This solution is obtained according to the following modes :

1.—By treating tar or crude tar oil with sulphurous acid, and by washing-out the resulting products with water or salt solutions.

2.—By treating a mixture of tar and water, or tar and salt solution, with sulphurous anhydride (SO_2).

3.—By treating a mixture of crude tar oil and water, or crude tar oil and salt solution with sulphurous anhydride (SO_2).

4.—By treating crude tar oil with sulphuric acid, and by displacing the organic bases by carbonate of soda, and utilizing the bases so obtained for treatment with sulphurous acid and water or salt solutions according to Mode 1.

By washing the gases containing ammonia and sulphuretted hydrogen with the solution prepared in any of the above ways, these impurities are removed from the gases.

The purification of the gases may be effected by liquors so prepared that they are strongly alkaline to methyl orange ; but it has been found by the patentee that the most energetic action upon the gases of the prepared aqueous solutions of organic bases occurred when the solution was neutral, or acid to methyl orange, as in these circumstances there is formed (especially at about 80° C.) a large quantity of polythionates, and that the absorption of ammonia and sulphuretted hydrogen was much more rapid. Moreover, it has been found that the aqueous solutions, either hot or cold, of the sulphited organic bases in tar, after having served to purify the gases, and being neutralized by sulphurous acid (neutralization being indicated by methyl-orange) undergo a transformation in the presence of sulphur, a certain quantity of sulphur dissolving in the solution with the formation of polythionates—the liquor ultimately precipitating sulphur and changing gradually into ammonium sulphate. The presence of sulphur is not necessary, it is said ; but it renders the transformation more rapid. Nor is it necessary that the liquor should be absolutely neutral in order to arrive at the formation of a sulphate ; for even with an excess of sulphurous acid the production of the sulphate is not prevented.

Either before, or on reaching the point of equilibrium, when further formation of ammonium sulphate ceases, or proceeds very slowly, the liquor may be removed for treatment to separate the sulphate. The mother liquor is used again for purifying the gases, or it may be resulphited or not, and brought again into contact with the gases to be washed so as to concentrate the sulphate before treatment to obtain such sulphate in crystalline form, or, again, the liquor may be mixed with fresh solution, after resulphiting if desired—the mixture then being brought into contact with the gases for washing purposes.

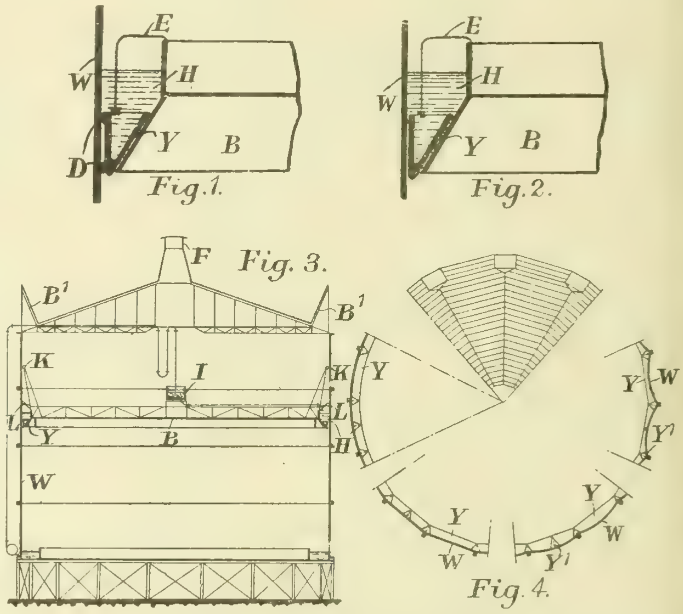
After several successive operations, the liquors become sufficiently charged with sulphate of ammonia, and the latter is deposited, in crystalline form, on the hot liquors being cooled. The sulphur in suspension in the liquor is separated by filtration before the crystallization of the sulphate.

Gasholders.

Maschinenfabrik Augsburg-Nurnberg A.G., of Nuremburg, Germany.

No. 6109 ; April 23, 1915.

This is a modification of the invention described in patent No. 16,184 of 1914, with the object of providing packing and sealing means "more efficient in action."



An Improved Nurnberg Gasholder.

Figs. 1 and 2 are sectional views of two forms of the improved packing. Fig. 3 shows a diagrammatic sectional elevation and a sectional plan of a modified form of the holder.

The packing consists of small metal sliding boxes Y open at the top, which may be provided with packing fillets D (fig. 1), or have smooth walls (fig. 2). Ordinary packing materials—such as strips of felt, jute, leather, metallic gauze, or other metallic packings—can also be laid between the fitting or packing fillets D. The boxes are of wedge-shaped section, connected with the disc B by the holders E, which, if necessary, may be resilient—"being capable of assisting the action of the pressure of the liquid H, or of preventing the sliding pieces from lifting." Between the ends of the sliding boxes, wedge-shaped or pyramidal packing pieces, as described in patent No. 16,473 of 1914, may be inserted. The invention can be employed for holders with and without a roof. If no roof is provided, then provision of draining means of ordinary type must be made, so that water collecting on the disc B may flow off.

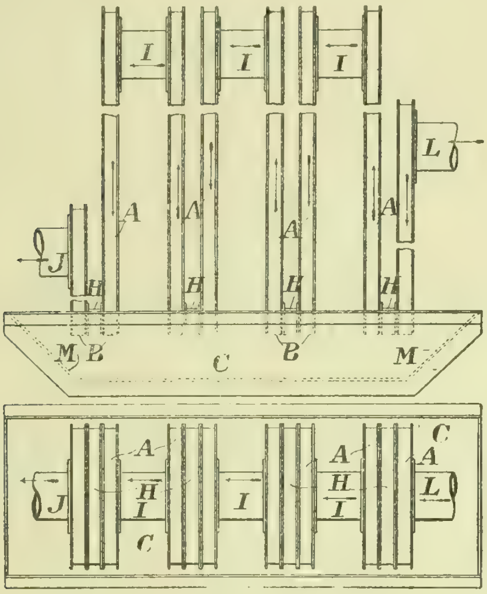
In figs. 3 and 4 an example of the improved holder is shown as composed of flanged sheet metal plate, closed at the top by a roof. The bottom is open, so that the space under the holder may be utilized. The collecting reservoir I, which is intended for receiving the pumped-up liquid, is here arranged on the disc-shaped crown B. It is guided by pairs of rollers K L lying one above the other, which roll either direct on the metal plates W or on brackets [not shown]. The upper guide rollers K, when in their highest position, enter into housings B^1 arranged on the roof, so that it is not necessary to make the shell of the holder higher than is necessary with respect to the volume of gas it is desired that it should hold. Ventilation can be effected by an erection F on the roof This ventilation device can at the same time, when the disc-shaped crown is in its highest position, serve for receiving the flexible tubes which supply the water to the reservoir.

Condensers for Use in Gas Manufacture.

Climie, W., and Lees, W., of Glasgow.

No. 4264; March 17, 1915.

This invention of "condensers or coolers for use in gas manufacture," particularly relates to the type of "cooler" in which a series of vertical pipes are arranged with their lower ends dipping into a liquor receptacle, as shown in the accompanying diagrammatic elevation, with a plan view of same.



Climie and Lees' Gas-Condenser.

The cooler consists of a series of vertical pipes A arranged with their open lower ends B dipping into water in an open tank. Preferably the pipes are formed by doubling or folding one half of a thin channel-shaped bar over the other half, so that the backs of each half face each other. The sides of the channel bars are covered by side plates so as to form a gas-tight joint—a chamber being thus formed which is open at its lower end and closed at its upper end. The cross section of the chamber is preferably rectangular with a rounded end, so that the gas, in passing through it, is spread out into a thin stream. An opening is formed near the lower end of each pipe in the side facing its neighbour, and a cover-plate H is arranged over the openings and between each pair of pipes. The gas is conducted to the upper closed end of the first pipe by a pipe L, and, passing downwards in the direction of the arrows, strikes the water at the lower end, where it forms a water-seal. The gas now passes through the opening at the lower end of the first pipe, along the surface of the water in the space between the first and second pipes, and through the opening at the lower end of the second pipe into the same. After passing upwards through the second pipe, it is conducted by a pipe I to the third pipe (which is the first pipe of the second pair of pipes), and so on through as many pairs of pipes as desired. The cooled gas is led from the upper end of the last pipe of the series by a pipe J to the scrubber or washer, to be further purified. The tank may be fitted with sloping sides M if desired, and a conveyor chain or the like may be arranged to automatically convey away any deposits in the tank.

Electric Igniting Apparatus for Gas-Burners.

Carpenter, C. C., of Old Kent Road, S.E.

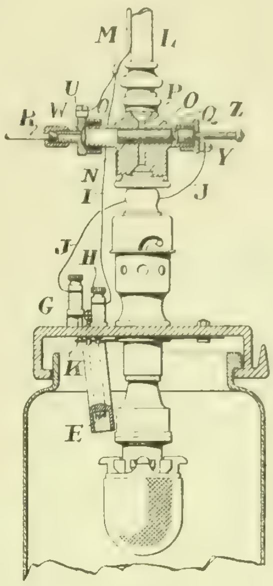
No. 18,504; Aug. 10, 1914.

This electric gas-burner igniter is of the kind in which the gas-tap and the electric switch are retained in a position near the burner and operated pneumatically from a distance. The gas-tap contains an endway movable plug arranged to complete an electrical circuit at the same time that it moves to open the passage-way for the gas.

The invention is illustrated as working an inverted incandescent burner of any well-known type. The hooded filament and the thermostat shown are as described in patent No. 26,156 of 1912.

The gas-tap comprises a metal piston N capable of sliding endwise in a horizontal metal casing O, across which there is a passage P for the gas in a vertical direction. When the gas descending the pipe L meets the full diameter of the piston, it does not pass; but when the piston is moved to bring the reduced portion Q into line with the passage P, the gas travels straight on to the burner. The piston is operated from a pneumatic switch of common construction [not shown] working through a pipe R connected to the end of the casing by a union and coupling-piece. The metal coupling-piece carries externally a terminal U for one of the wires from the electric cable M; but it is insulated from the casing by a collar of insulating material, while within the coupling-piece is a metallic contact spring W, so placed as to contact with the piston N when the latter is moved into a position to permit the passage of the gas. At the end of the casing opposite the coupling-piece is a cap carrying a terminal Y connected by the wire J to the terminal G. The other lead I, from the cable M, connects direct on to the terminal H. Z is an extension on the end of the piston which, passing through the cap, provides means for manipulating the piston directly by hand.

The gas-tap is shown closed and the electric circuit broken. When the pneumatic switch is manipulated, the piston N is sucked towards the left so as to bring it up against the spring contact W and at the same time bring the reduced portion Q into line with the passage P. The effect of this movement is to open the gas supply at the burner and complete the electric circuit of the igniter E at the same time.



Carpenter's Electric Igniter for Gas-Burners.

The reverse movement of the switch returns the piston, cuts off the gas, and breaks the circuit at the contact W, so that, on the cooling of the thermostat K, the circuit will remain interrupted and be ready for a repetition of the operation described.

LEGAL INTELLIGENCE.

Complaints as to the Ticehurst Gas Supply.

Uncomplimentary remarks as to the gas supply at Ticehurst were made in the course of a claim at Hurst Green Petty Sessions by the Wadhurst and District Gas Company against a consumer who had refused to pay an account amounting to £4 16s. 2d. The defendant said that for five or six years the consumers in Ticehurst had been complaining about the gas; and the men in his shop had had to leave off work because they could not get enough light. He had also been charged for more gas than he had had. Mr. Alfred Bower, on the other hand, said the present Company had only had the concern since July, 1914; and he was only claiming for the account for the six months from Christmas. Defendant had proved to be a very troublesome consumer. The meter had been changed on several occasions; and an offer had been made to have the present one examined—if found incorrect, the Company would pay the cost of testing. Defendant, however, would not agree to this. Addressing the Bench, defendant said his complaint was that "the consumers had not received gas, but air." The Magistrates decided that they could not take into account the quality of the gas. Defendant must, if he wished, institute other proceedings against the Company in reference to this. The meter registered a certain amount; and they made an order for the payment of the account, with 4s. Court costs.

Stealing Gas at Manchester.

William Pritchford, a plumber, of Emma Street, Manchester, was charged last Thursday with stealing 100 cubic feet of gas, value 4d., the property of the Manchester Corporation. Mr. A. F. Pickford, prosecuting, said the quantity named was merely a nominal amount, as it was not known how much gas the man had really stolen. At one time, the prisoner was an authorized gas-fitter and plumber on the Corporation official list, but his name had recently been removed. He continued, however, to do odd plumbing jobs, and eventually transformed his workshop into a restaurant. In the basement a prepayment meter was fixed, serving a large cooker and seven or eight lights in the rooms. For some time past the Gas Department officials had suspected that the meter was being tampered with; but it was very difficult to prove that any offence was being committed. However, about 8.45 p.m. the previous day, Chief-Inspector Capon, of the Gas Department, accompanied by two detectives, paid a surprise visit to the premises. Accused was not at home; but his wife was. The wife was told the nature of the errand; but she declined to let the officials see the meter in the absence of her husband. They, however, insisted on seeing it, and it was found that the inlet and outlet had been disconnected, and a supply of gas obtained through a piece of ½-inch rubber tubing. One of the detectives went in search of the prisoner, and brought him to the cellar, where, in his presence, the rubber-tubing was removed, and the meter properly connected up. When the man was charged with stealing the gas, he replied "Guilty." According to the meter card there had been a marked diminution in the amount of gas used at the premises; the accounts being only about one-third of the average of the previous quarters. When the meter was opened, only twelve pence were found in the money-box; these having been put in by the prisoner after being taken into the cellar. In mitigation of the offence, Mr. R. J. Watts said the accused had had serious financial losses; and when his name was removed from the list of authorized plumbers to the Corporation, he sustained a further loss. To some extent the reduction in the amount of the gas accounts was due to the fact that the man formerly used gas in his plumbing business. This, however, had now been given up. Poverty had driven him to commit the offence. Prisoner was sentenced to one month's imprisonment.

MISCELLANEOUS NEWS.

FACTORY AND WORKSHOP LIGHTING.

The First Report of the Departmental Committee.

There was issued at the end of last week by the Home Office, as a Blue-Book, the first report of the Departmental Committee on Lighting in Factories and Workshops. This is accompanied by a memorandum epitomizing the proceedings; and the main portions of this, together with the recommendations and other points contained in the report, will be found below. The Committee were appointed to inquire and report as to the conditions necessary for the adequate and suitable lighting [natural and artificial] of factories and workshops—having regard to the nature of the work carried on, the protection of the eyesight of the persons employed, and the various forms of illumination. The members of the Committee appointed were Dr. R. T. Glazebrook, C.B., D.Sc., F.R.S. (Chairman), Mr. Leon Gaster, Professor Francis Gotch, D.Sc., F.R.S., Mr. J. Herbert Parsons, M.B., D.Sc., F.R.C.S., Mr. W. C. D. Whetham, F.R.S., and Sir Arthur Whitelegge, K.C.B. (Chief Inspector of Factories). At an early stage of the proceedings, Professor Gotch unhappily died; and Professor C. S. Sherrington, D.Sc., F.R.S., was subsequently appointed to fill the vacancy. The Joint Secretaries were Messrs. D. R. Wilson and C. C. Paterson. The Committee met the first time in February, 1913; and 38 meetings have been held.

In the course of their inquiry, the Committee examined fifty witnesses; and a series of appendices to the report indicate the lines on which the investigation was conducted. Occasion may be taken to notice some of the features of these appendices. Meanwhile, it may be stated that among the professional, technical, and scientific witnesses examined were Messrs. J. G. Clark and How (Gas Light and Coke Company), Mr. Albert Stokes (South Metropolitan Gas Company), Messrs. A. J. Whyte and J. Angus (the Keith-Blackman Company), Mr. Franklin Thorp (Institution of Gas Engineers), and Messrs. Haydn Harrison, V. H. Mackinney, and J. S. Dow (Illuminating Engineering Society). Their evidence we shall hope to deal with later. The Committee paid visits to a large number of works in various industrial centres; while experiments on standards of illumination for different purposes were carried out at the National Physical Laboratory. In view of the wide grounds covered by the terms of reference, it was thought desirable to limit the inquiry in the first instance as far as possible to the textile, engineering, and clothing trades; certain general principles, common to all trades, however, being at the same time taken into consideration.

The development of industrial operations, and the introduction of many new methods of illumination during the last ten years have served to emphasize the need for statutory requirements relating to the lighting of workshops and factories, similar to those which already exist in regard to heating and ventilation.

The recognition that defective illumination may be a contributory cause to accidents, may be injurious to the health and eyesight of workers, and may exercise a prejudicial effect upon the output and quality of work, has led to general interest in the question of industrial illumination.

The present Committee was appointed "to inquire and report as to the conditions necessary for the adequate and suitable lighting (natural and artificial) of factories and workshops, having regard to the nature of the work carried on, the protection of the eyesight of the persons employed, and the various forms of illumination."

This memorandum is intended as a brief summary of the principal contents of the report and appendices. Reference to these is necessary for the full appreciation of the reasons which have led the Committee to their conclusions and of the facts on which they are based.

EXISTING LEGISLATION.

For the United Kingdom no general provisions in regard to lighting (analogous to those regarding heating and ventilation) occur in the Factory Acts, although adequate lighting in general terms is included among the conditions to be satisfied in underground bakehouses, and is required in certain dangerous trades. On the other hand, the codes of all the chief European countries, the United States, and India contain provisions requiring adequate lighting in factories.

NATURE OF INQUIRY.

The appointment of the Committee in regard to industrial lighting thus marks an entirely new departure in this country. The novel nature of the inquiry entailed special methods of investigation.

In view of the wide ground covered by the terms of reference, it was considered advisable to limit the inquiry in the first instance as far as possible to the engineering, textile, and clothing trades. Evidence was received from fifty witnesses, including H.M. Inspectors of Factories and representatives of various Trade Associations and Scientific and Technical Societies.

The members of the Committee also paid a series of visits to various industrial centres—85 works being visited. In connection with these visits, about 4000 measurements of illumination were made in 163 rooms in 57 factories—the data, as a rule, being prepared previously to the visit. In this way the members were able to form a clear conception of the conditions represented by a certain numerical value for the working illumination, and to compare this with the figures mentioned by various witnesses and found in the existing literature on the subject. Certain experiments bearing on the standards of illumination required for various purposes were also carried out at the National Physical Laboratory.

EFFECTS OF BAD LIGHTING.

The inquiry showed that there has been a great advance in methods of illumination; but various defects were met with which are enumerated in the report. In taking evidence and in the study of existing literature, the Committee endeavoured to obtain particulars of the effect of unsatisfactory lighting.

A statistical inquiry into the number of accidents during each month throughout the year points to the conclusion that inadequate lighting is a contributory cause of accident. This is confirmed by the evidence of witnesses regarding accidents in foundries, shipbuilding yards, and cotton mills, and by the statements of the Accident Offices' Association, which embraces most of the Insurance Companies interested in the Workmen's Compensation Act.

Complaints of eye strain, headache, &c., attributed to insufficient lighting are common; and while an exhaustive medical inquiry would be necessary to establish the connection between these defects and inadequate lighting, there is a general impression that unsatisfactory lighting is, in various ways, prejudicial to health. It is also recognized that insufficient light adds to the difficulty of the proper supervision of work, and of the maintenance of cleanliness and sanitary conditions generally.

Witnesses gave specific instances of the effect of improved lighting in increasing the output and improving the quality of work turned out.

RECOMMENDATIONS.

From the evidence taken it is apparent that there is a general consensus of opinion as to the economic and hygienic advantages of adequate and suitable lighting. That this opinion is based on experience is shown by the great improvement in lighting which has taken place during recent years, and is still continuing; and in modern factories good lighting is now regarded as one of the most important factors contributing to industrial efficiency. On the other hand, many employers have lagged behind in the general advance. This refers especially to old factories; and it is obvious that any requirement which would tend to bring such places up to the level of more progressive firms would be beneficial not only to the operative, by improving his working conditions, but also to the employer himself, by increasing his output and by improving the quality of the work. Light is a cheap commodity, and little or no hardship should result from such a requirement, if gradually and sympathetically enforced.

The Committee therefore recommend that:

(1) There should be a statutory provision:
  - (*a*) Requiring adequate and suitable lighting in general terms in every part of a factory or workshop, and
  - (*b*) Giving power to the Secretary of State to make Orders defining adequate and suitable illumination for factories and workshops, or for any parts thereof, or for any processes carried on therein.

It is further necessary to indicate more precisely what is conveyed by the term "adequate lighting." Broadly, the illumination may be said to be adequate and suitable provided that:

(i) it is sufficient for the proper carrying out of the work both as regards quality and output, and

(ii) there are no lighting conditions prejudicial to the health, comfort, and safety of workers.

In order to satisfy these requirements, the illumination should comply with the following requirements:

(*a*) Adequacy.

(*b*) A reasonable degree of constancy and uniformity of illumination over the necessary area of work.

(*c*) The placing or shading of lamps so that the light from them does not fall directly in the eyes of an operator when engaged on his work, or when looking horizontally across the workroom.

(*d*) The placing of lights so as to avoid the casting of extraneous shadows on the work.

The next question is the desirability of specifying the amount of illumination implied in the terms "adequate and suitable." Owing to the great progress that has recently been made in the appliances for measuring illumination (the nature of which is explained in the report), it is now practicable to specify numerical values in a manner that would hardly have been possible some years ago.

It is, therefore, proposed to specify the minimum intensity of illumination desirable, from the standpoint of general convenience and safety in parts of the workshops where work is normally carried on, and in yards, passages, and open spaces along which people are ordinarily liable to pass.

The following four recommendations are made under this head:

(2) Over the "working areas" of workrooms the illumination measured on a horizontal plane at floor-level shall not be less than 0·25 foot-candle,* without prejudice to the illumination required for the work itself.

(3) In all parts of foundries in which work is carried on, or over which any person is ordinarily liable to pass, the illumination measured on a horizontal plane at floor-level shall not be less than 0·4 foot-candle.

(4) In all parts of factories and workshops—not included under recommendation (2)—over which persons employed are liable to pass, the illumination measured on a horizontal plane at floor-level shall not be less than 0·1 foot-candle.

(5) In all open places in which persons are employed during the period between one hour after sunset and one hour before

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* The meaning of the term foot-candle is explained in the report as the illumination produced by a light source of one standard candle at a point of a surface one foot from the source, and so placed that the light rays from the source strike the surface at right angles. Thus if a source of one candle be placed at a height of one foot above a horizontal table, the illumination at the point on the table vertically below the source is one foot-candle. Similarly, with a source of 50 candles at a distance of one foot, the illumination is 50 foot-candles; while if the distance is increased to 10 feet, since the illumination is inversely proportional to the square of the distance from the source, the illumination at the point on the table vertically below the lamp will be 50/100, or 0·5 foot-candle. If the point on the table is not vertically below the source, the obliquity at which the light is incident must be taken into account, and the calculation is less simple; but the illumination can still be expressed in foot-candles. Illumination can, however, always be measured directly by means of suitable instruments without recourse to calculation.

> sunrise, and in any dangerous parts of the regular road or way over a yard or other space forming the approach to any place of work, the illumination on a horizontal plane at ground-level shall not be less than 0·05 foot-candle.

These values are suggested without prejudice to the special illumination required for the carrying out of the work, which naturally varies greatly according to the nature of the operations. At present the Committee are not prepared to recommend standards of illumination for these purposes, which require further investigation.

In recommendation (6), provision is made for exemption of individual cases, and of factories to which the above requirements could not be applied; and the case of shipbuilding yards is to receive separate consideration.

Finally, in recommendation (7), suggestions are made for periodical cleaning of windows.

In conclusion, the Committee point out that the minimum values prescribed are considerably lower than those proposed by many witnesses, and are also lower than those found to exist in the majority of factories visited. In many cases manufacturers would naturally prefer to provide a substantially higher value than that indicated. The intention has been to propose values which can be adopted as a practical legal minimum without causing hardship, and would serve the purpose of raising the level of illumination in those factories which are behind modern practice in regard to methods of illumination.

The Committee did not feel justified in drawing any distinction between direct, indirect, and semi-indirect lighting, nor between systems which differ in the colour composition of the light. Similarly, the standards are intended to apply equally to natural and artificial lighting—that is to say, when the natural illumination falls below the prescribed limits, it must be supplemented or replaced by artificial illumination.

The data given in the appendices will be of service to those engaged in designing new factories and in examining the adequacy of lighting in existing buildings. At present there are few collated data of this character available, and the desire not to withhold them longer from publication is a further reason for the submission of a preliminary report at this stage.

Adequate artificial lighting is an important matter in the utilization of factories for night work; and a close connection appears to exist between the lighting conditions and the quality and output of work. The information contained in the report should therefore be of special interest at the present moment, when many factories are working overtime, and preparations are being made for the period of the year when artificial lighting is mainly required.

EXTRACTS FROM THE REPORT.

Recommendations.

In submitting our recommendations, we think it desirable briefly to review the circumstances which in our opinion justify us in the proposals we are about to make for the legal regulation of lighting in factories and workshops.

From the evidence taken by us, it is apparent that there is a general consensus of opinion as to the economic and hygienic advantages of adequate and suitable lighting. In support of this, we would refer to Part E. of the "Summary of Evidence" [Vol. 2 of the report], from which it will be seen that H.M. Inspectors of Factories, the experts in illumination, and the representatives of the scientific societies and of the employers' and operatives' associations all agree as to the importance of good illumination and as to the growing recognition of the fact. That this opinion is based on experience is shown by the great improvement in industrial lighting which has taken place during recent years, and is still continuing. In the designing of modern factories, good lighting (both natural and artificial) is now regarded as one of the most important factors contributing to industrial efficiency.

On the other hand, it must be admitted that many employers have lagged behind in the general advance. This applies especially to old factories, designed before the importance of illumination was generally recognized, and to small workshops, on which the occupiers perhaps hesitate to expend the capital necessary for improvement.

It is obvious that any requirement which would tend to bring such places up to the level of the more progressive firms would be beneficial not only to the operative, by improving his working conditions, but also to the employer himself, by increasing his output. Light is a cheap commodity; and little or no hardship should result from such a requirement, if gradually and sympathetically enforced.

Reference has already been made to the evil effects of unsatisfactory illumination. It has been shown that there is evidence of a relationship between accident risk and adequacy of lighting. Complaints as to damage to eyesight resulting from bad lighting conditions are general in character, and specific instances of injury are difficult to substantiate; but there is evidence of the existence of minor ailments and general impairment of efficiency which must eventually re-act on the health of the workers.

There can be no doubt that the degree of comfort in the working conditions is largely determined by the adequacy of the lighting. The visits paid to factories have enabled us to realize not only the contrast between the depressing effect of dark surroundings and the cheerfulness of a brightly illuminated workroom, but also the vast difference in the working lives of the operatives that must result from continual employment under the two conditions. This was made very clear during the experiments with workpeople carried out at the National Physical Laboratory, and also in the course of the observations in factories.

Finally, the necessity of prescribing adequate lighting in factories and workshops has long been recognized abroad; and the industrial codes of all the principal countries contain provisions requiring it in general terms. As has been already stated, definite minimum standards for certain fine processes have been in force in Holland since 1895; and in accordance with the progress of all matters connected with illumination, the original values have recently [1911] been doubled. A minimum standard for general illumination, also, is in force in New South Wales. Several witnesses—some of whom were opposed to the fixing of definite standards—agreed that the virtual omission of any reference to lighting in the British Factory Acts is a serious defect.

In view of these considerations, we feel justified in recommending that a requirement in general terms for adequate and suitable lighting be applied to all factories and workshops. We are fully aware that, until it is possible to define standards, difficulties may arise from time to time in the enforcement of the requirement. Many instances, however, have been brought to our notice, where, without the making of any measurements, it was obvious that the illumination was "inadequate;" and a general provision, such as that proposed, would seem to be essential for the improvement of such conditions.

Precedents for the making of such general provisions exist already in the Factory Acts for temperature [Factory Act of 1901, section 6]:

> (1) In every factory and workshop adequate measures must be taken for securing and maintaining a reasonable temperature in each room in which any person is employed. But the measures so taken must not interfere with the purity of the air of any room in which any person is employed.
>
> (2) The Secretary of State may, by special order, direct, with respect to any class of factories or workshops, that thermometers be provided, maintained, and kept in working order, in such place and position as may be specified in the order.

And for ventilation [*Ibid*, section 7]:

> (1) In every room in any factory or workshop sufficient means of ventilation shall be provided, and sufficient ventilation shall be maintained.
>
> (2) The Secretary of State may, by special order, prescribe a standard of sufficient ventilation for any class of factories or workshops, and that standard shall be observed in all factories and workshops of that class . . . . . .

In both of these sections, the requirements are expressed in general terms; and, in the case of ventilation, the Secretary of State is empowered to prescribe a definite standard for any class of factories or workshops. Now it is clear that in the case of lighting, while it is possible to make a statutory provision in general terms as to its suitability, it is impracticable to lay down in an Act definite standards as to the amount of illumination required for various classes or parts of factories, or for the numerous processes carried on in them. The requirements applicable to each industry can only be determined after careful inquiry. It is necessary, therefore, if standards are to be established, to give to the Secretary of State power to prescribe these by Order; and we recommend that this be done.

It is realized that the analogy between temperature and ventilation on the one hand, and lighting on the other, is not quite complete. In the first place, temperature, and, to a less extent, ventilation can be expressed in terms, the significance of which is generally understood; and in any given instance "adequacy" or "inadequacy" can be defined by numerical values which are now generally accepted. In the case of lighting on the other hand the unit of illumination, the foot-candle, although fully established and of perfectly definite meaning, is an expression with which few are familiar, with the consequence that in many instances the criterion of adequacy at present consists merely of subjective impressions.

Again, in the cases of temperature and ventilation, convection and diffusion tend to bring about a condition of approximate uniformity throughout the room. Illumination on the other hand has a characteristic value for each separate point, and diversity must constantly exist in the illumination at the different points in the room.

Broadly the illumination may be said to be adequate and suitable, provided that—

> (*a*) It is sufficient for the proper carrying out of the work, both as regards quality and output, and
>
> (*b*) There are no lighting conditions, prejudicial to the health, comfort, and safety of workers.

In order to satisfy these conditions the lighting should comply with the four requirements:

> (1) Adequacy.
>
> (2) A reasonable degree of constancy and uniformity of illumination over the necessary area of work.
>
> (3) The placing or shading of lamps so that the light from them does not fall directly on the eyes of an operator when engaged on his work, or when looking horizontally across the workroom.
>
> (4) The placing of lights so as to avoid the casting of extraneous shadows on the work.

We are of opinion that the general statutory requirement of "adequate and suitable lighting" should include the observance of the last three conditions, in addition to the provision of an adequate amount of illumination, and that power should be given to secure compliance with them in cases where their neglect clearly renders the lighting "inadequate and unsuitable" in any of the particulars given above. Special emphasis may be placed upon the avoidance of glare, of excessive contrast, and of flickering lights.

As the conclusion, then, of this part of our inquiry, we recommend that:

> 1 There should be a statutory provision—
>
> (*a*) Requiring adequate and suitable lighting in general terms in every part of a factory or workshop, and
>
> (*b*) Giving power to the Secretary of State to make Orders defining adequate and suitable illumination for factories and workshops or for any parts thereof or for any processes carried on therein.

Standards of Adequacy.—In view of part (*b*) of the above recommendations, we have now to consider the question of the provisions to be embodied in such Orders. We have seen that though the intensity of the light at the working plane is the most important factor of adequacy and suitability, it is by no means the only one; and in making any Order the other factors must receive due weight. Even taking this criterion alone, lighting requirements vary so much that each trade, or even each process, must be considered on its merits, and a standard of anything like general application is possible in well-defined circumstances only.

In cotton weaving, for example, the optimum illumination varies with the colour of the yarn, the fineness of the yarn, the style of weave, and other circumstances; and a single standard prescribed to cover cotton weaving generally would err in some instances in the direction of prodigality, in others of insufficiency.

This aspect of the question has been touched upon in the course of their evidence by many witnesses, who, while impressing on us the extreme difficulty of framing a regulation to cover all the processes of their trades, agreed in thinking that there might be some requirement specifying a minimum illumination for general lighting to secure the prevention of accidents.

A standard founded upon the numerical value of illumination deals with only one aspect of the problem. It should be used, therefore, by the authorities as a guide to the most important factor in adequate lighting rather than as an exhaustive criterion. It is possible from this point of view to group working conditions in various trades according to the minimum amount of illumination which may be regarded as adequate. This can be done only empirically; and, as has been seen, a large part of the work of the Committee has been devoted to obtaining for this purpose data regarding a few selected trades—viz., clothing, engineering, and textile. The results in full and also summarized are published separately. The summaries are also reproduced in Appendix XV. to the report, and form, we believe, a unique analysis of existing industrial lighting conditions. These observations allow a judgment to be formed as to the average existing practice in this country. But for the present (for reasons given elsewhere) we think it desirable to reserve any expression of opinion as to the minimum amounts of illumination which are needed for special processes.

Leaving thus for the present the consideration of the illumination required for special processes, we proceed to deal with the more general illumination of the factory or workshop as a whole under three heads:

A. The illumination of workrooms or parts of workrooms where work is in progress—that is, of the working area of the factory.

B. The illumination of passages, stairways, lobbies, &c., and places in workrooms or other parts in factory premises over which persons are liable to pass but which are not parts of working areas.

C. The illumination of open yards and approaches.

By "working area" we understand that portion of the floor occupied by, and in the immediate neighbourhood of, the machines, benches, plant, or material, at which the operatives stand or sit in the execution of their work. In this area we include gangways and alleys between or around such working places.

A. *Workrooms.*—The methods of lighting of workrooms may be classified as follows:

(i) General lighting, whereby an illumination is produced which is approximately uniform throughout the whole room;

(ii) Localized general lighting, whereby an illumination is produced which is approximately uniform over a portion or portions of the room in question;

(iii) Local lighting, with the object of lighting some particular portion of a machine or locality by an arrangement of individual lamps acting independently of one another; and

(iv) Combined local and general lighting.

Where general lighting alone is adopted, there is in most instances little risk of the floor of the room being insufficiently illuminated, since the same light must serve also for the carrying on of the work. But with localized general lighting there is always some danger of parts of the room being neglected; while with strong local lighting, the contrast between the brightly illuminated work and the comparatively dark surroundings necessitates careful attention to the general lighting of the room.

Whatever be the light required for the work, it is necessary that the working area should be illuminated sufficiently for obstacles, dirt, and waste to be clearly visible; while in all industries—particularly those in which the work involves danger—it is essential that the general illumination should be sufficient to avoid risk of accidents. Ample illumination for the requirements of the work itself must be provided beyond the minimum general illumination needed.

Information as to the illumination in existing factories is given in the frequency of occurrence curves for floors of workrooms [Appendix XV.] The mid-point, or point above and below which an equal number of observations lie, is 0·45 foot-candle. For the purpose of an Order we have, however, to consider what may reasonably be enforced as a statutory minimum, rather than what is now the average practice, and having regard to this, we recommend that:

2. Over the "working areas" of workrooms the illumination measured on a horizontal plane at floor-level shall not be less than 0·25 foot-candle, without prejudice to the illumination required for the work itself.

Our attention has been called to the special difficulties which would be caused if a ship under construction or repair were considered for the purpose of this regulation as part of the working area of a factory; and we desire, therefore, to reserve for future consideration the question of the illumination to be provided on ships. Special provision also will be necessary for certain workrooms, where the prescribed illumination would interfere with the proper carrying out of some process, such as the manufacture of photographic materials.

The lighting of iron foundries was one of the points under discussion at a conference held in January 1913; but in view of the appointment of the present Committee, no decision was then arrived at. The question whether these should be excluded from the above recommendation, and made subject to a special standard, has received consideration. It appears to be true that the illumination in these foundries is at present below the average of other workrooms. For this there is no justification. On the contrary, the dark surroundings and want of contrast in iron-foundries indicate the desirability of specially good lighting; and we are of opinion that a minimum illumination of 0·25 foot-candle is not sufficient for safety. We accordingly recommend that:

3. In all parts of iron-foundries in which work is carried on, or over which any person is ordinarily liable to pass, the illumination measured on a horizontal plane at floor-level shall be not less than 0·4 foot-candle.

B. *Passages, Stairways, Lobbies, &c.*—For the satisfactory lighting of these, a lower illumination will suffice than in the case of workrooms; since obstacles are usually absent, and the eye is not subjected to the same degree of contrast. Nevertheless, in the course of visits to factories, many instances of defective lighting were noticed, and complaints were received from witnesses on this point, especially in reference to cotton mills. The experience gained from visits to factories, and such observations as we have been able to make, together with the evidence brought before us, indicate that it is desirable to adopt for these places a standard of not less than 0·1 foot-candle. Instances requiring special latitude (such as long passages free from turns and abrupt changes of level, and adequately lighted by the "beacon" system) may be dealt with under recommendation 6. We accordingly recommend that:

4. In all parts of factories and workshops not included under recommendation 2, over which persons employed are liable to pass, the illumination measured on a horizontal plane at floor-level shall be not less than 0·1 foot-candle.

C. *Open Yards and Approaches.*—Here the object of the lighting is to enable a person to see sufficiently well not to stray from the path, and may be compared with that of streets. For any locality where persons are employed at night, and for a path or road to which it is necessary to keep in order to avoid danger—such as an approach leading through a yard containing obstacles—we are of opinion that a minimum illumination equivalent to that of a fairly well-lighted side street (0·05 foot-candle) will be sufficient.

Approaches over clear ground (free from projecting rails or other obstacles and from steps or other abrupt changes of level) where momentary straying from the path involves no risk, and also fenced-in roads, can be adequately lighted by the "beacon" system—namely, the spacing of light sources along the direction of the path at such long intervals that they serve as beacons or guides rather than as means of illumination. These would not be "dangerous parts" in the intended sense of the next paragraph.

In docks, both places of employment and approaches are already subject to a requirement for adequate lighting in general terms. [Regulations for Docks, Reg. 3]. We recommend, in accordance with this precedent, that:

5. In all open places in which persons are employed during the period between one hour after sunset and one hour before sunrise, and in any dangerous parts of the regular road or way over a yard or other space forming the approach to any place of work, the illumination on a horizontal plane at ground level shall be not less than 0·05 foot-candle.

We desire to reserve for a future report the case of shipbuilding yards, which require special consideration, and to which we have not yet been able to devote attention.

Exemptions.—In order to meet exceptional circumstances in which the standards proposed in recommendations 2, 3, 4, and 5 might cause hardship, we recommend that:

6. There shall be power for the Department to allow exemption in individual cases.

Under recommendation 2, for instance, exemptions might be permitted in the case of little-frequented areas which would otherwise come under the designation of working areas.

[After dealing with the question of enforcing the periodical cleaning of windows, the Committee recommend the following general provision:

7. All external windows of every workroom shall be kept clean, on both the inner and outer surfaces.]

Conclusion.

In submitting these recommendations we realize that the standards proposed by us appear to be lower than the values put forward by various lighting experts who have given evidence before us. Some of the latter referred to the general illumination at the working level, where the values are naturally higher than at the floor-level; and in any case we have felt that they were intended as an indication of ideal conditions, whereas it has been our object to suggest numerical values that can be adopted as a practical legal minimum without causing hardship. It must be remembered that, in view of the diversity of illumination which always exists whatever the system of lighting, any minimum value will usually connote a very much higher maximum and average; so that with a given minimum the efficiency of the illumination depends to a large extent on this diversity. A workroom, for instance, in which the illumination is uniform, and has the value of only 0·25 foot-candle, may be regarded in most cases as very inadequately lighted. We desire, therefore, to point out that none of the recommendations made by us is intended to supersede the requirement of general adequacy and suitability, which, as already explained, depend on several factors in addition to the amount of illumination.

The evidence before us from witnesses and our own observations do not justify us in drawing any distinction in the present recommendations between direct, indirect, or semi-indirect systems of lighting, or between systems which differ in the colour composition of the light. We suggest, therefore, that the standards proposed should be adopted irrespective of the type of lighting. Similarly, the evidence does not justify us in discriminating between natural and artificial lighting; and in the recommendations submitted by us, the standards are intended to apply equally to both—that is to say, when the natural illumination falls below the limits proposed, it must be supplemented or replaced by artificial illumination.

The more specific recommendations of this report may be said, broadly, to deal with the general lighting of factories and workshops—in other words, they have for their object the maintenance in all workplaces of certain standards of illumination primarily intended to ensure the personal safety of workpeople moving about the premises. In the great majority of factories, however, the standards of general lighting suggested here would be inadequate for the actual machines and work benches where the various manufacturing processes are carried on, and local lighting in addition is generally essential. As already mentioned, we are not prepared at present to suggest values for the minimum illuminations which may be regarded as adequate for special processes.

It was originally our intention to supplement the data already collected for the clothing, engineering, and textile trades, and to extend our inquiries on similar lines so as to include other industries. In view, however, of the present economic disorganization, we think it desirable to submit an interim report of the work already done and to await settled conditions before further prosecuting the inquiry.

The data given in several of the appendices will help those engaged in designing new factories and in examining the adequacy of lighting in existing buildings. At present there are few collated data of this character available; and the desire not to withhold them longer from publication is a further reason for the submission of a preliminary report at this stage.

We are greatly indebted to various firms and private individuals whose assistance has been readily given; and we desire to express to all of them our grateful thanks.

The value of the experimental results detailed in Appendix XV. is due in no small degree to the care and skill bestowed on a difficult task by Messrs. J. W. T. Walsh and G. F. Sedgwick, by whom the observations were made; while the wide knowledge of factory conditions possessed by our Secretary, Mr. D. R. Wilson, and the experience, in questions of photometry and other scientific matters dealt with, of his colleague Mr. C. C. Paterson, have proved of the utmost value. We desire to record our keen sense of the importance of the services rendered by these gentlemen and our cordial thanks for their very efficient help.

(Signed) R. T. Glazebrook (*Chairman*). C. S. Sherrington.
L. Gaster. W. C. D. Whetham.
J. Herbert Parsons. Arthur Whitelegge.

D. R. Wilson
C. C. Paterson } *Joint Secretaries.*

LEA BRIDGE DISTRICT GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Tuesday, at the Offices, Nos. 63 & 64, Chancery Lane, W.C. —Mr. A. M. Paddon, M.Inst.C.E., in the chair.

The Secretary (Mr. Richard Sandell) read the notice convening the meeting; and the report [*ante*, p. 471] and the statement of accounts were taken as read.

The Chairman, in moving the adoption of the report and accounts, remarked that the former had already acquainted the proprietors with all the more important facts in connection with the state of affairs to be laid before them. It set forth that there had been a satisfactory increase in the sale of gas—particularly welcome at such times as these. It assured the proprietors that they would receive the same dividend as heretofore; and he thought this, in itself, was not a small matter, when judged by the example of other gas companies who had not been quite so successful in this regard. It also stated that a small amount of extra capital had been raised—a fact at which the proprietors would not be surprised—when they remembered that the works were undergoing reorganization on a very complete scale.

THE ACCOUNTS.

He did not intend to deal with the accounts at any great length. They were not only explicit, but they were presented in exactly the same form half year after half year; and this form was prescribed by the Board of Trade. If, however, there should be any point in them which it might be thought required further explanation on his part, he would, of course, be happy to give the information desired. The revenue account would show them that the Directors had been careful to make the proper apportionments before declaring a profit; and these apportionments must be absolutely staggering to some of those present, when compared with the relatively small apportionments indulged in by some other companies not so very far away. But by doing as their Company did, he felt the Board would earn in an increased degree the confidence of the proprietors.

WORKING RESULTS.

With regard to the technical and practical side, the expectations which had been formed at the time the reorganization of the works was undertaken had been very largely realized; and it was hoped that the results would be still further improved in the future. But when he told them Mr. Cross had succeeded in selling in the past six months over 13,000 cubic feet of gas per ton of coal carbonized, this would show that they were not very far behind at the present moment. That they should presume to expect an improvement on this figure was characteristic of these days, because even 13,000 cubic feet was far beyond what any company could compass ten or twelve years ago. The unaccounted-for gas was less than 3 per cent., which, again, was, of course, a very good figure. It was really in these refined economies, if he might so term them, that they found their means of resisting the general tendency of evil times, because, as the proprietors knew, all materials were very much dearer now; and although against this fact they had to set-off the increased return from residuals, this would be very far from compensating them for the enhancement of prices unless they could initiate and develop further and additional economies in the processes at the works. And, of course, they had to be careful in their spending—they would all have to be. This was one of the self-evident things the Government had warned them about, among the multitude of things they had not warned them of. The satisfactory financial results which were presented that day were the outcome of all this effort on the part of every department of the Company.

ADVANTAGES OF GAS.

No doubt, however, those present would be very much more concerned about the future than about the past. On this point he could not altogether re-assure them, because the degree of uncertainty which attached to affairs in a national sense also attached to industrial matters. But looking at things broadly and generally with reference to the gas industry, there was a very great deal to give them heart. In the first place, they might congratulate themselves on the fact that their undertaking was of the character of a public utility; and this meant that if the consequences of the war should press more heavily on the community in the future than at present, very many things would have to be foregone before people could do without gas. In the old days, if anybody was displeased with gas he turned to coal or petroleum; but if anyone turned to coal to-day, he would be relying upon a very, very shaky reed, because coal was so dear that gas at anything like the price at which it was retailed was far more economical to the average person, and vastly more economical to the poor person, than was coal. Of course, their business in the main depended upon the prepayment meter system; and they could be quite sure the poor man who used this apparatus would not be consuming gas to the extent he did if he had not been convinced in happier days that it was cheaper and served his purpose better than coal. And coal at its present price made the advantages of gas very much greater. It was certainly a big benefit to the poor to have such a supply as their Company could give them.

CHEAP OIL.

While there was the menace of increased coal prices, it must be remembered that, roughly speaking, only about one-half their gas was made from coal. For the remainder, they depended upon oil; and the situation with regard to oil was most reassuring. Oil had never cost them less than it had during the war; and the price had not been raised the remotest fraction of a penny. So that when they reflected that half their supply was dependent upon oil, which they could get in this way without hindrance, it mitigated their anxiety with regard to the question of coal. Then, again, he did not think that oil would go up materially after the war; but it did seem to him that the aftermath of the upheaval would, with reference to the coal supply, be serious to the last possible degree. There was a member of the Board who could probably give them most valuable information on this point; and he thought he would agree that there was very little chance of cheap coal again on the cessation of war. But there was a chance of cheap oil. Of course, nobody was a prophet to-day; and things might not so turn out. But it was necessary to look ahead as far as possible; and this was a reasonable expectation with which they might comfort themselves.

LOOKING FORWARD.

He did not think they had anything to fear in their district from electrical competition. They had, of course, supported this now for something like twenty years; and by reason of the nature of the district, it was not likely that electricity would do any harm, where the supply was carried out by business methods. They had probably already seen the end of the artificial stimulus which the municipal authorities applied to the supply of electricity in their own interests. Under all the circumstances, he sincerely hoped that, if it was his duty to address the proprietors six months hence, he would be able to present a statement as satisfactory as the one presented that day. The increase of business was still going on; and, as he had mentioned, the new plant was fulfilling expectations, and fresh economies were being brought to book.

Mr. G. W. Carey having formally seconded the motion,

Mr. E. L. Burton congratulated the Board, and the proprietors also, upon the very excellent account which had been laid before them. That it should be possible to show an increase of 2·26 per cent. under the circumstances of the past half year, when the public lighting and outside shop lighting had been curtailed, and when gas lighting had been under other disabilities, was little short of remarkable. Not only had there been this increased output of gas, but the financial figures were excellent. To be able to carry forward almost the same amount of profit as was brought into account, was an achievement which, he thought, very few companies had found possible this half year. The thanks of the proprietors were due in a larger measure than usual to the Board and their officials.

The resolution was then put, and unanimously carried.

The Dividends.

Proposed by the Chairman, and seconded by Mr. A F. Phillips, dividends were declared (less income-tax) at the rates per annum of 5 per cent. on the preference stock and 6½ per cent. on the consolidated ordinary stock; and it was resolved that £644 be carried to reserve.

The Work of Officers and Staff.

The Chairman then moved a vote of thanks to the executive officers for their all-important contribution to the results of the half year. He remarked that the proprietors would realize that, in common with those responsible for gas companies throughout the kingdom, their task had been one of anxiety during the period to which the accounts referred. This much went without saying; but there had been anxieties in connection with their own Company which, he was thankful to say, were not general, and altogether abnormal. The outbreak of war caught Mr. Cross just when he was in the state of transition to which he had already referred. They were at the works changing the system of carbonizing from a comparatively antiquated to a new and more efficient one. There was no more trying time in the duties of an executive officer than when a change of this kind was being made; and it was a time at which the highest pitch of results was not looked for. Mr. Cross had, however, not only successfully effected the change, but had done so without sacrificing a jot or tittle of the very high standard that had always charecterized his work. As to the financial side, Mr. Sandell had given the unfailing support which they would expect from his long and devoted service to the Company. He had enabled an issue of capital to be effected in a highly successful manner at a difficult time; and to accomplish this needed experience and tact. And what had been characteristic of the two heads of the departments, had been characteristic of the men all through. The Company had made a very large contribution to the fighting forces. Indeed, they had not a single man who could fight and was not fighting. In the revenue account, it would be seen that there had been expended during the half year £626; and he was sure the proprietors would not grudge a farthing of it, for it was given to the dependants of the men who were at war, and to help those whom the conditions of war had rendered unable to live on their pay. It amounted to nearly 1d. per 1000 cubic feet; and against all these extra charges the Company had only increased the price 2d., and were, as a matter of fact, only charging 1d. per 1000 cubic feet more than their great neighbour the Gas Light and Coke Company. Though these details applied to the accounts as a whole, they did testify to the efficiency, skill, and devotion of their principal officers.

Mr. A. W. OKE seconded the proposition, which was heartily agreed to.

Mr. SANDELL and Mr. F. W. CROSS briefly responded; the latter pointing out that the unaccounted-for gas should really be averaged over the whole year, as there would be a variation in the different periods. As to the use of gas by the working classes, Mr. Cross said that a single slot-collection [of which they had six in the half year] in certain of the districts into which they divided the area, showed a 30 per cent. increase. This proved the extent to which the working classes were using gas.

Mr. GISBURNE proposed a similar compliment to the Chairman and Directors.

Mr. BURTON, in seconding, remarked that the Board were to be highly congratulated upon the bold policy they were pursuing in the matter of depreciation. They had written off in the capital account £4757, which was equal to 1½ per cent. on the capital. As a proprietor, it was to his interest that this should be done; but he was a proprietor who was not oblivious of the interests of the consumers, and he said in their interests, too, that the policy which the Board were pursuing was a very wise one, and would in the end reflect on the price of gas in an unmistakable manner. When the war was over, and things were again normal, it must have a direct effect in reducing the price of gas, a consummation to which they all looked forward.

The CHAIRMAN'S acknowledgment terminated the proceedings.

NORTH MIDDLESEX GAS COMPANY.

The Half-Yearly Meeting of the Company was held on Monday of last week, at the Offices, No. 5, Great Winchester Street, E.C.—Mr. A. M. PADDON, M.Inst.C.E., the Chairman, presiding.

The SECRETARY (Mr. E. L. Burton, F.S A.A.) read the notice convening the meeting; and the Directors' report—*ante*, p. 470—and the statement of accounts were taken as read.

The CHAIRMAN remarked that, before proceeding to the formal business of the meeting, he was sure those present who were not already aware of the matter would hear with very great regret of the death of their esteemed colleague on the Board, Mr. John Heal. As long ago as last April, Mr. Heal was the victim of a street accident, and died shortly afterwards. He was elected a Director in 1877, so that for 38 years he had occupied a position on the Board. He (the Chairman) could speak of him from personal knowledge for the last 21 years; and he could assure the proprietors that during all this time his contribution to the administration of the Company was a most valuable one. He had known the undertaking almost from its inception; and as a local resident, he had a singularly intimate knowledge of those matters which affected the prosperity of a company in its particular area. Mr. Heal had been succeeded on the Board by Mr. A. F. Phillips, who occupied in many respects the premier position among gas engineers of the day; and when a company of the size of theirs, with the very small inducement they could offer him, were able to secure a Director of this stamp, it was unnecessary to emphasize the advantage it constituted to the Board and the proprietors. As to the report and accounts, it would be realized with satisfaction that, so far as they had gone across the sea of trouble since the commencement of the war, the Company had suffered very little loss, and experienced very little derangement in the conduct of the business. There had been a small increase in the sale of gas for the half year; and this was more than they could legitimately expect, because they did not share in any of those activities attaching to the organization of war. They had no industries which developed to a high degree. It was a residential district; and, as such, they were mainly influenced by the curtailment of the incomes of those whom they supplied, so that they might fairly have expected a decrease. The report explained very much what they knew already with regard to the atmosphere of general difficulty; and the significant fact was that it had been necessary to raise the price of gas 2d. per 1000 feet. The benefit of this had only accrued from the end of March; so that the increase, which was not a large one, had had a very small effect on the figures. They would agree that it was quite a modest rise to demand from the consumers; and the Directors were not without hope that they might be able to get through the difficulties before them without still further enlarging it. After having brought the profits resulting from the past six months into account, and disposed of them according to the necessities of the occasion, they carried forward a slightly reduced amount to the next account—the difference between £4662 and £3967. Finally, the report stated that there had been raised £17,500 by the issue of additional ordinary shares, which had been passed to the credit of the capital account. This in itself was a matter for congratulation. The issue was, of course, made some time after the war began; and the money was raised at slightly under 5½ per cent. This showed that the credit of the Company was good, and it also showed that they were indebted to the Secretary for the fact that the issue was conducted with skill and circumspection. In the capital account there were two sums of £18,491 and £28,950 yet to be issued; and it was shown that the total capital received for the purposes of the undertaking was £213,398. This brought the capital per million cubic feet of gas sold per annum to £697, which was very much higher than it had been for some years past, and also much more than he cared to see in the accounts. But the works had been brought up to the highest pitch of modern efficiency. There were no works in the kingdom conducted on more improved technical principles than were their own to-day; and, of course, this brought its fruition into the revenue account, by reason of the margin of profit which would declare itself later. It would be seen that coal had only cost £123 more, in spite of the increased sale of gas. With regard to the items in the revenue account for the repair and maintenance of works and plant, mains and service-pipes, meters, and stoves and fittings, which comprised the amounts allotted to depreciation, these showed that there had been so expended a sum equal to nearly 14d. per 1000 cubic feet, before the declaration of any profit. Then there was an item of £484 for allowances to dependants of employees on active service, which amounted to another ¾d. per 1000 feet. These were very large sums to take out of the revenue account, before coming to the question of profit. In bad debts there was a big increase at £343, which was ½d. per 1000 cubic feet. This did not represent bad debts actually incurred; but the Board recognized that they were passing through a time in which they must look for an amplification of this item, so had apportioned a certain amount in anticipation of troubles to come. This seemed to him a prudent policy to adopt, where it could be done. After all this, the balance carried to profit and loss amounted to £5584, which was £676 less than a year ago; and it was also, incidentally speaking, £694 less than was required for the purpose of dividend and other charges. Out of 200 men in the employ of the Company, 53 were serving their country, having joined one or other of the branches of the fighting forces. He therefore felt certain that the proprietors would approve of the expenditure voluntarily undertaken with regard to their dependants at home. ["Hear, hear."] In the general balance-sheet, it was stated that there had been expended on alterations to, and renewal of, works and plant £2500. This was a suspense account—a thing they none of them liked. But in this half year they had reduced the amount by £1000 out of profits. That was to say, six months ago it was £3500; and by reason of the charges to revenue they had reduced it to £2500 in one half year. This would, at all events, convey the impression that they had the residue very well in hand. The reserve, insurance, and renewal funds had all been written-down. They carried forward in the reserve fund £17,723. This represented the value of the investments written-down to the Government minimum, and therefore the actual value of the fund as it stood to day. The same thing applied to the other two funds he had named; so when they appeared in the next statement they should preserve their proper relation to actual values, unless there should be further depreciation meanwhile. From the benefit fund account only £5 had been disbursed in the half year; but the revenue account had contributed £158. It was certainly advisable to keep this fund at the respectable figure of £739, because then they would be able to suspend contributions to it for a period, if times became leaner still. As showing the efficiency of the manufacturing operations, he might state that they sold 13,112 cubic feet of gas per ton of coal carbonized; and the gas used on works and unaccounted-for was 6·37 per cent.—a perfectly justifiable figure for a company like theirs, where the three centres of consumption were all removed from each other. Now, with reference to the future. He could only say they had a very large stock of coal. Contracts had been made as far ahead as possible, and on no worse terms than those offered to their neighbours. They had also a big stock of oil, which was being obtained at a low price. In these matters, they could see their way for six months ahead; but, of course, with regard to circumstances generally, they could not tell what was before them. They had, however, thought of everything possible, down to insuring their works against aircraft. He concluded by moving the adoption of the report and accounts.

Mr. H. A. LERMITTE seconded this; and it was carried.

Mr. J. H. WARDEN moved, Mr. F. R. SMITH seconded, and it was agreed, that the sincere regret of the meeting be conveyed by the Secretary to the relatives of the late Mr. John Heal.

On the proposition of the CHAIRMAN, seconded by Mr. H. F. LOFTS, dividends for the half year were declared, less income-tax, on the preference capital at the rate of 5 per cent. per annum, on the original ordinary capital 11 per cent. per annum, and on the additional ordinary capital £7 14s. per cent. per annum.

The CHAIRMAN, in proposing a hearty vote of thanks to the Secretary, Engineer, and staff, said the very excellent figures he had quoted in Mr. Trewby's department showed how well the works were being carried on as regarded carbonizing. His results in the matter of fuel were just as good. He was getting a percentage of coke equalled by very few works—11½ cwt. per ton clear of the retort-house, and coming into account. The returns from sulphate of ammonia were singularly good; and altogether Mr. Trewby was serving the Company admirably. As to Mr. Burton, he had had to the full his share of the difficulties.

Mr. JOSEPH CASH, in seconding, said he could sympathize with Mr. Trewby on the way in which he had had to carry on during the past half year under special difficulties. The working was excellent.

The motion was cordially passed, and briefly acknowledged by Mr. LAWRIE TREWBY and Mr. BURTON.

A similar compliment to the Chairman and Directors, on the proposition of Mr. SMITH, seconded by Mr. W. G. BEAUMONT, brought the meeting to a close.

WORTHING GAS COMPANY.

The Half-Yearly Meeting of the Worthing Gaslight Company took place on Saturday week—Mr. H. H. GARDNER presiding. The report and accounts [see *ante*, p. 415] were submitted.

The CHAIRMAN stated that £5000 more stock had been issued, realizing a net sum of £4677. The expenditure on capital account had been £6554; and there had been written off for depreciation of meters, stoves, and fittings £1479, making the net increase of capital £5075. This account, therefore, stood at a total of £147,628. Dealing with the revenue account, the Chairman said the expenditure on coals was £11,320, as against £9655 in the corresponding period of last year—an increase of £1664, which was accounted for partly by the increased quantity carbonized, and partly by the increased cost of coal through their inability in the early part of the year to obtain deliveries of the coals contracted for, resulting in compulsory purchases of inferior coals at a considerably increased price. They had had an anxious time, but (he was glad to say) did not fail with the supply of gas; and in spite of all their troubles they had earned their dividend. The total manufacturing charges showed an increase of £1369. On the receipts side, gas sales showed an increase of £844, notwithstanding a reduction in public lighting of £499. The balance to the credit of the revenue account carried forward to the profit and loss account was £4383, as compared with £3372 at the corresponding period, or an increase of £1011. The balance now standing to the credit of the profit and loss account and available for dividend was £23,809. The Chairman announced that the new gasholder at Goring was now completed, and would soon be in use. It would prove a valuable addition to the Company's plant, and relieve some of the anxieties of the management. He also made an interesting statement as to the important part the Company had played in helping to meet one of the nation's greatest needs, and added that it would be well for the public to adopt gas for heating and cooking as far as possible during the coming winter, not only because there would be a probable shortage of other fuel, but for reasons connected with the war. Having regard to the difficulties he had mentioned and to war conditions, stringent lighting orders, and the fact that so many of the staff had left to serve their country, they could congratulate themselves on the general working results.

The report having been adopted, a dividend was declared of 5 per cent. per annum (less income-tax) on the consolidated ordinary stock.

Mr. S. O. Stephenson (the Manager), replying to a vote of thanks to the staff, said they had been working under such circumstances of difficulty as he had never known before; and they would deserve all the sympathy and support they could get from the consumers in the near future. He referred to the important help they had been able to give to the Government; and on this account he asked for the indulgence and co-operation of the consumers.

BARNET DISTRICT GAS AND WATER COMPANY.

High Make of Gas per Ton—Small Increase in Price.

The Half-Yearly General Meeting of the Company was held yesterday week, at the Holborn Restaurant, High Holborn, W.C.—Mr. Arthur F. Phillips, M.Inst.C.E., in the chair.

The Secretary (Mr. Ernest W. Drew, F.C.A.) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The Chairman, in moving their adoption, said the business during the half year had only been carried on with considerable anxiety. The cloud of the awful war continued to overshadow everything; and rendered it difficult to obtain supplies and material necessary for the manufacture and distribution of gas. In the early part of the year, it was difficult to procure coal. The supply at the collieries was short; and the prices demanded were exorbitant. There was also considerable delay in transit; the claims on the railways for the conveyance of war material being so considerable that ordinary traffic had to stand on one side. There was further trouble on account of labour—some of the best and most able men joined the Colours; and those who remained demanded an addition to their wages to meet the increased cost of living. Fortunately, the Company had just introduced retort-charging machinery, by means of which the number of men required to produce the gas was greatly reduced. The result of this was that, notwithstanding these troubles, the cost of labour on the gas-works was slightly below that of the corresponding half of last year. While speaking of labour, he might mention that the Company had not lost so many men to the Colours as some works—probably through having older men in their employ. Of the total number of workmen 21 per cent., and of the office staff 40 per cent., had joined the country's forces. The gas made during the half year amounted to 102,866,000 cubic feet—only a slight increase on the corresponding half of 1914, when it was 101,718,000 cubic feet. The increase would have been larger had it not been for the reduction in consumption for public lighting, and for the suppression of outdoor shop lamps. The make of gas per ton of coal was 14,076 cubic feet, of which 13,295 cubic feet were sold. The coke for sale was 10·37 cwt. per ton of coal. Such results were evidence of most satisfactory carbonizing. In the water undertaking, the quantity of water supplied was 402,657,000 gallons—an increase of 21,096,000 gallons on the corresponding half year. Reverting to the gas undertaking, he said that last year at Lady-day, the price of the gas was reduced 2d. per 1000 cubic feet. This year as from Lady-day, to meet the great increase in the cost of coal and other material, the 2d. had had to be reimposed. The Directors hoped, with this slight addition to the price, to be able to meet all requirements. There was on this occasion no addition to the capital account of the gas undertaking. All that had happened was that, while an amount of £23 had been spent on mains, &c., there was a credit of £90 for a small strip of land sold to the Railway Company to adjust their boundaries—thus causing the capital account to show a diminution of £67. In the revenue account, coal, oil, and coke for gas manufacture cost £7560, against £6848—the difference being due to the higher prices paid for manufacturing materials. Wages amounted to £1036, against £1054. Repairs and maintenance of works had cost £1642, as compared with £1898. On repairs and renewal of mains and services £666 was expended, against £1014. Public lamps cost £511, against £393. All the other expenses were much the same as in the previous half year. The receipts for gas totalled to £15,894, as compared with £15,889—only £5 more. It must, however, be remembered that the price of gas for the Lady-day quarter was 2d. per 1000 cubic feet lower than in the previous year, and that the price was 2d. higher for the quarter ending Midsummer last than in the Midsummer quarter of the previous year. Coke yielded £2755, against £2670, though the prices that could be realized for it in the Company's district were not so good as those obtainable in some other companies' areas. The market for tar was bad. This product only realized £421, against £856. The receipts for sulphate of ammonia were £564, as compared with £463. The result of the half-year's working of the gas undertaking was a falling-off of the profit from £4584 to £4061, showing that the Directors were justified in raising the price of gas by 2d. The capital account of the water undertaking showed additions of £288 for further land and £64 for mains and services, making a total of £352. The expenditure on water revenue was nearly the same as in the corresponding half year—totalling to £9184, as against £9171. The water-rental showed little increase; totalling to £24,493, as compared with £24,300. But this was not to be expected, seeing that there had been little or no building or development proceeding in the district since war was declared. The resulting profit on the water undertaking was £15,393, against £15,210. It would be seen from the profit and loss account, that 100 guineas was contributed to the National Relief Fund; and £2000 was transferred to the contingency fund. After providing for income-tax and interest on loans and debentures, there remained a balance of £36,748. The proposed dividends would absorb nearly £13,300—leaving about £23,450 to be carried to the current half-year's accounts. The future was full of anxiety; and, while the awful war lasted, it was impossible to say what the Company might have to contend with. Every possible precaution was being taken to hold good stocks of coal and other material; but who could say what labour difficulties there might be in front? The demands that the continuance of the war might make upon labour might be serious, and the needs of the nation must be met. He (the Chairman) had recently visited all the Company's pumping-stations and the gas-works, and could assure the proprietors that everything was in the most efficient state, and capable of meeting all probable requirements. In conclusion, he said the Directors considered it advisable to insure the gas and water works against damage by aircraft; and this had been done with the Government.

Mr. Alfred Lass seconded the motion.

Mr. L. Andrews congratulated the Chairman and Directors and the proprietors on the position of the undertaking. He had looked through a good many balance-sheets of gas companies this half year; and he must say that this one showed sound direction and good management.

The motion was unanimously carried.

Proposed by the Chairman, and seconded by Mr. Samuel Cutler, dividends were declared (less income-tax) at the rates per annum of 9 per cent. on the "A" and "C" stocks, 8 per cent. on the "B" stock, and £6 6s. per cent. on the "D" capital (gas and water) stocks.

The Chairman moved a vote of thanks to the Engineer and Manager (Mr. F. J. Bancroft), the Secretary (Mr. E. W. Drew), and the other members of the staff, for their services during the half year. He remarked that in his opening address he had alluded to the excellent work Mr. Bancroft had done in the gas-works; and he could assure the proprietors it was equally good in the water-works. If any of the proprietors at any time happened to be in the neighbourhood of Tyttenhanger, and paid a visit to the pumping-station there, they would be able to form some idea of the excellent work that Mr. Bancroft did, and the care with which he expended the capital of the Company. They were also much indebted to Mr. Drew for the way in which he kept the accounts, and the satisfactory manner in which he carried on the general business. The whole of the members of the staff had served the Company most loyally during the half year.

Mr. H. G. Hills, in seconding, observed that, notwithstanding the difficult times (as described by the Chairman) through which they had been passing, the proprietors were receiving good dividends. While congratulating themselves upon this, they could most heartily thank the officers of the Company for what they had done for them.

The motion was cordially passed.

Mr. Bancroft, replying for his staff and himself, said he appreciated very highly the kind words used by the Chairman in reference to his (the speaker's) work and that of those working with him. Those in authority in gas and water undertakings had never had to work harder than now, nor had they ever had such anxious times as those through which they had been, and were now, passing.

Mr. Drew also thanked the Chairman and proprietors for the kind words used, and so heartily endorsed. They would be highly appreciated by every member of his staff as they were by him.

Mr. Andrews, in proposing a vote of thanks to the Chairman and Directors, remarked that it said a great deal for the management of this Company that the proprietors were receiving such good dividends, while some other companies had had to largely reduce theirs. As to the increase in the price of gas, he noticed that all the Directors had had to do was to put on again the amount that was taken off twelve months ago. This was very satisfactory. All the proprietors had the greatest confidence in their Board.

Mr. Hills seconded the motion, which was heartily agreed to.

The Chairman, in expressing the appreciation of his colleagues and himself, said there might be troubles in front; but the proprietors might rely upon the Board doing their best to meet them.

MANCHESTER ELECTRICAL DEPARTMENT.

Defence of the Policy of the Committee.

Only a sparse attendance of the members of the Manchester City Council were present at the monthly meeting last Wednesday. Chief interest centred in Mr. Ross Clyne's proposal [*ante*, pp. 256, 471], asking for the appointment of a Special Committee, and an independent expert, to inquire into the policy of the Electricity Department.

Mr. Ross Clyne (who is a member of the Gas Committee) delivered a long speech, in the course of which he animadverted upon the policy of the department. He criticized the intention of the Committee to build the largest generating station in the world at Barton, at a cost of over half-a-million of money. He considered that the business of the Committee was not done as it should be. The Council, he said, had been kept too long in the dark regarding the working of the scheme. It was stated that the new station would be required at the end of the war, for the needs of the city. He, however, was afraid they were going to have a "white elephant" upon their hands. In this matter there was a clash of interests. He complained that a large sum had been spent in costs, without the permission of the Council. Things were done by the Electricity Committee which would not be tolerated by a private venture. There were, he alleged, secret dealings with members of the Committee and large firms which the rank and file of the Committee knew nothing about. He mentioned this at the Local

Government Board inquiry held in Manchester into the proposed new electricity station. The Corporation should spend money as they would spend their own; and he contended that the Electricity Committee had not done this.

Mr. Pierce, who seconded, contended that some things at the electricity station were obsolete. The Committee had put nothing aside for renewals.

Alderman Walker (Deputy-Chairman of the Committee) pointed out that Mr. Clyne was at one time a member of the Committee; but he failed to attend one-half of the meetings. From time to time the fullest information was given as to the policy adopted; and large majorities of the Council had supported this policy. Committees of the Houses of Lords and Commons had passed the scheme; and the Local Government Board had sanctioned it. The increased demand for electricity had enabled the department to make huge strides, notwithstanding statements to the contrary. Firms engaged in the manufacture of munitions had stated in writing that very serious harm would be done if the new scheme was not gone on with. Only a few weeks ago an Inspector of the Local Government Board had visited Manchester to see where further curtailment could be made in municipal expenditure; and it had been decided that these new works were necessary, and that they must be proceeded with. At present their resources were being strained to the uttermost; and in erecting a new station, the Committee were bound to go where there were millions of gallons of water available—on the Manchester Ship Canal. The reliability of the electricity service had been the means of bringing new industries to the city.

Mr. Clyne's motion was lost—only two hands being held up for it.

STOCKPORT CORPORATION GAS DEPARTMENT.

Capital and Expenditure.

At a Meeting of the Stockport Town Council last Wednesday, Mr. Henry Bell, D.C.L., J.P. (the Chairman of the Finance Committee), moving the adoption of the various accounts of the Corporation [an abstract of which had been prepared by the Borough Treasurer, Mr. H. Grundy], took the opportunity of replying to the contention of Alderman Graham, in reviewing the gas accounts at the previous meeting, that it was not wise, when capital was required, to obtain it by further borrowing, inasmuch as they were thereby building-up the capital debt and increasing the burden which the town had to meet. In one sense, said Mr. Bell, they did this; but it must be remembered that they paid back some of the outstanding debt every year. There had altogether been £524,037 spent on gas; and the total capital owing was £243,959, or less than one-half the amount expended. It was also contended that capital expenditure should be borne to a large extent out of revenue. The Gas Department had raised and paid £156,376 towards capital expenditure. The capital debt owing last March was £3907 less than it was twelve months ago, in spite of the fact that £7872 additional capital expenditure had been incurred during the twelve months. As to the benefit to the ratepayers from the capital invested in the gas undertaking, it was shown to be 1½ per cent. Some people said it should be 5 per cent. The return to the ratepayers on the capital sunk in the electricity undertaking was only 1¼ per cent.

Alderman Fernley (an ex-Chairman of the Gas Committee) seconded the motion, remarking that, as compared with similar towns, Stockport stood very well indeed financially.

Mr. Royle wondered how it came about—not professing to be a financier—if the town was in such a good position, that there was any necessity to increase the rates, and put 6d. per 1000 cubic feet on the price of gas.

Mr. Bell observed that Mr. Royle's remarks had reference to revenue. Every Committee required more money for the year's work; and there was less to be given from the profits of the Corporation. Therefore the balance was bound to be made up by the ratepayers.

The Council approved minutes of the Gas Committee which contained the terms of settlement of a recent minor dispute, and alluded to a joint application made to the Board of Trade by the Corporation and the Municipal Employees' Association for the appointment of a practical person to examine and adjust the wages in the Gas Department.

PROPOSED INCREASE OF PRICE AT WIGAN.

The minutes of the Gas Committee presented at the monthly meeting of the Wigan Borough Council led to a long discussion, owing to a divergence of opinion regarding the extent to which it would be advisable to increase the price of gas. By a majority the Committee had agreed to recommend an increase for all purposes of 8d. per 1000 cubic feet; but two members voted that the rise should be 9d.

Alderman Angus, in moving the adoption of the minutes, said the outlook for the gas undertaking for the next twelve months looked very serious; and it was likely there would be a deficiency through increased expenditure and reduced receipts of something like £16,000. It was, however, estimated that they might get from coke an extra £3000, and £1000 from sulphate of ammonia; but they hoped to get more. This left a total increase of £12,275 to be provided for over the estimates. Now there were only two ways in which they could hope to get the money. One was by asking the ratepayers to allow it to go on the rates, and the other was to increase the price of gas. Probably some of them might say that the rates had benefited by the profits of the Committee in years gone by, and that it was only natural, now there was a deficiency in this abnormal year, that the rates should be used to help them out of the difficulty. The Committee, having carefully considered the matter, wanted to be fair to the Council and to the town, and to say that, though in the past they had given money to the relief of the rates, as now constituted the Committee had no intention of giving any more. Their intention had been, had times been normal, to reduce the price of gas according to the profits made, so that the small consumer should have the benefit. Seeing this was their intention, they thought it was hardly fair they should come to the ratepayers and ask them to meet the deficiency. They asked the public to bear with them in such an abnormal year—because they hoped it would not last more than a year—and he would give the promise to consumers that in future they would get the benefit of a reduced price for gas according to the profits that were made. The increase in the cost of coal was 4s. 9d. per ton, which on 38,000 tons amounted to £9025. The increased cost of gas oil was £1000; sulphuric acid, which was used to make sulphate of ammonia, £400; increased wages, £350; iron, lead, and other stores, £350; war allowances to soldiers' families, £50; war bonus, £650; reduced consumption of gas, £1500. He did not know how the last item would work out, because the reduced consumption was brought about by the street lighting. The reduced revenue from tar was £1000. Wigan was in a fortunate position, in that their contracts for coal did not expire until late in the year. It was thought, and even said, by some people, that the Committee had made a mistake in allowing things to run so late in the season before they made their contracts. They had not made any mistake; but, on the other hand, they had saved the town hundreds of pounds. Wigan was not the only town in difficulty, because he had a list of places before him where the price of gas had already been raised from 5d. to 9d. per 1000 cubic feet. They proposed to increase the price of gas in Wigan by 8d., with the promise, as he said before, that when they found they were making a profit they would give it back to the consumers.

Mr. Baucher, in moving an amendment that the minutes be confirmed with the exception of the one relating to the price of gas, urged that the figures submitted in favour of a rise of 8d. required further consideration. The gas-works as a whole, he said, needed overhauling; and he wanted the Committee to go thoroughly into the whole position. They should face the worst now.

Alderman Dickinson seconded the amendment, because he believed it was not a safe business proposition to only raise the price 8d. They all deplored the position of the Gas Department; but they had to face the matter as they found it. He asked the Manager (Mr. F. Betley) what he thought would cover the deficiency for twelve months; and he said: "At least 9d." It was known and discussed by the Committee that 8d. would leave a deficiency of between £2000 and £3000, which it was suggested should be taken out of reserve. It was their duty to see that the Gas Committee cleared themselves without calling upon the rates; and by taking the matter back, some means might be devised which would effect their object.

Alderman Angus said the Committee had no objection to the minute going back; but they did not like nasty statements being made.

The minutes were then approved with the exception of the paragraph referred to.

OLDBURY GAS-WORKS ACCOUNTS.

The statement of accounts of the Oldbury gas undertaking for the year ended March 31 was issued last Friday by the Manager (Mr. C. H. Carder).

On loan capital account, the total amount borrowed to March 31 was £85,399. There has been repaid £28,516, leaving £56,883 outstanding. The quantity of gas consumed was 148,245,800 cubic feet; the total sales amounting to £17,098. There was received £1293 for public lighting and under contracts; and the residuals realized £5391. Discounts and allowances were £828, making the income from all sources £23,093. The total expenditure was £21,708, leaving a gross profit to be carried to profit and loss account of £1385.

The accounts will be considered at the October meeting of the Council.

METER REPAIRS AT BLACKBURN.

Works to be Utilized for Munition Making.

The Blackburn Town Council at last Thursday's meeting discussed a proposal of the Gas Committee to reduce the staff of meter repairers at the Jubilee Street works from twelve to three, and to devote the premises to the making of munitions.

Mr. Bates, on the matter coming up, asked whether the Chairman of the Gas Committee (Alderman Nuttall, J.P.) was aware that nine out of the twelve meter repairers who were trade unionists had been discharged, and that the three retained were non-unionists.

Alderman Nuttall said the three men were retained because they were the oldest men, and not likely to get jobs elsewhere. The others were all capable and were able to get work—particularly on munitions. Mr. Morton Fyffe, the Gas Engineer, had promised to take them back at the first opportunity.

Mr. E. Porter (the local Secretary of the Gas-Workers' Union) moved to refer the minute back. He said it was not understood in Committee that devoting the premises to munition work meant the discharge of workmen. It had been shown that money was saved by the Committee doing their own meter repairs; and to discharge nine men from the place meant sending work out of the town and incurring additional expense.

Mr. Bates, who seconded, said that Mr. Fyffe, in his interview with a deputation, had expressed the opinion that three men could do the meter-repairing in Blackburn, and added that he was not sure that it would not be cheaper to send the meters away for repair. Humane considerations might have influenced Mr. Fyffe in retaining the services of the older men; but younger men with wives and children were also worthy of consideration.

Sir Edward Hamer (the ex-Chairman of the Gas Committee) said that if, as stated, three men could do the work of twelve, it pointed to some mismanagement in the past which should be inquired into. Was this a move to get the meters sent out of Blackburn for repair; and, if so, was it an economical policy?

Alderman Nuttall characterized Mr. Bates's version of what had occurred at the interview with Mr. Fyffe as "totally untrue." He denied that Mr. Fyffe had discussed the points with Mr. Bates—the whole statement was a fabrication, as Mr. Fyffe was not in a position to say whether it would be cheaper to send the meters out of Blackburn for repair. The nine men, the speaker added, were not being dispensed with with any such idea; and though it was true that their week's notice expired that (Thursday) night, they were told that it would not take effect probably for three or four weeks.

After the Town Clerk had explained that the passing of the Gas Committee's report would not prevent them giving consideration to the position of the men, and endeavouring to find them employment, the report was adopted.

ZÜRICH GAS UNDERTAKING.

Report and Accounts for the Year 1914.

We have received from the Zürich gas undertaking a copy of the report and accounts of the Corporation Gas-Works for the year 1914. The following is a summary of its contents.

The report opens with observations on the effect of the outbreak of war on the working conditions of the gas-works. The mobilization of the whole of the Swiss Army which followed the outbreak of war had a great effect on the working. To compensate for the loss of the men called up, a change was made from eight-hour to twelve-hour shifts; and in the first few months of the war the charges were left in the vertical retorts for twelve hours instead of ten hours. Later, when other men had been trained to do the work, normal conditions of working were restored. After some delay, owing to the scarcity of workmen, the construction of the new ammonia works was completed. At the time war broke out the stocks of coal on the works were quite up to normal; but the supply from Germany ceased at once on mobilization. Official representations, however, secured permits for further export from Germany, and small consignments of Westphalian and English coal were obtained from stores on the Upper Rhine, and, later, deliveries from the Westphalian and Saar pits were obtained, though the quantities fell short of those contracted for. Recourse was had to descriptions of coal not commonly used on gas-works, and considerably increased prices had to be paid for these special supplies. The Coal Association of Swiss Gas-Works assisted greatly in securing deliveries of coal.

The gas consumption in August last year receded by 12·4 per cent. compared with August, 1913; and at the end of the year there was a decreased consumption of 8 08 per cent. The decrease was principally among private consumers. The reduction would have been greater but for the installation of large numbers of prepayment meters for 20 centime (2d.) pieces. On the outbreak of war the importance of the stock of coke—which was about normal—to the City was recognized; and in view of the great demands which at once ensued from private consumers, deliveries were restricted to half-a-ton apiece.

The export of ammonia and tar to other countries having ceased with the outbreak of war, concentrated liquor was worked-up to sulphate, and tar was consumed under the boilers on the gas-works and in other ways. The old ammonia works was provisionally restored for the working-up of liquor to sulphate. Later a very strong demand set in for the vertical-retort tar for use in Diesel engines, for which the normal supplies of crude oil or tar oils were unobtainable. The vertical-retort tar gave quite satisfactory results for the purpose. In view of the uncertainty of the coal supply, public lighting was restricted to the lamps which ordinarily are kept alight throughout the night, and in most of the lanterns with two burners only one burner was used. The conditions had a very adverse effect on the accounts of the undertaking for the year, the net profit being 170,000 francs (£6800) less than the estimate.

The new double centrifugal pump erected for keeping the works' drainage system clear of water when the River Limmat is in flood discharges at the rate of 440 gallons per second through a 36-inch main. After the well (which was sunk in 1913) had been in use for six months, the water from it was again examined, and found to be good drinking water, though hard.

The mains have been extended to supply certains suburbs of Zürich. For the whole year the gas consumption showed an increase of 0·11 per cent. over that for the preceeding year. The total production of gas was 37,784,600 cubic metres (1,333,353,150 cubic feet), the average make per ton of coal carbonized being 12,501 cubic feet. The make of gas per ton of coal in the inclined retorts was 11,124 cubic feet, in the settings of ten vertical retorts 12,939 cubic feet, and in the settings of eighteen vertical retorts 13,040 cubic feet. The coal carbonized was almost wholly German, and the average cost of coal per 1000 cubic feet of gas made was 2s. 1d., as compared with 2s. in 1913. The private gas consumption was 86·86 per cent. of the total, and the gas unaccounted for was 3·55 per cent. The balance was consumed in public lighting, public buildings, and on the works. The coke consumed as fuel under the retorts amounted to 14 per cent. by weight of the coal carbonized in the inclined retorts and in the settings of eighteen vertical retorts, and to 15 per cent. in the settings of ten vertical retorts. Steam was introduced into the vertical retorts.

The yields of bye-products, in percentages by weight of the coal carbonized, averaged as follows: Coke, 70; real ammonia, in gas liquor, 0·2328; tar, 6·35; retort carbon, 0·023; Prussian blue in cyanide sludge, 0·054. The yield of tar is slightly higher; but the yield of other bye-products is the same as, or slightly lower than, in 1913. Anthracene oil was used for extracting naphthalene from the gas at the rate of 2 oz. per 1000 cubic feet.

The examination was continued of the efficiency of various gas fires and cookers. The fires with columns of incandescent fuel (as used in England) were found to give a better heating of the lower parts of the room, and thus avoided the evil of cold feet. Such fires, having actually a lower total heating efficiency, afford (the report states) a more rational heating than other types of fire with a higher efficiency. There are at present gas-cookers on the market having from 60 to 70 per cent. efficiency, and with certain adaptations a still higher efficiency is obtainable. As regards utilization of the total available heat from the gas or current, the gas cooker is thus scarcely inferior to the electric cooker.

Investigations were carried out in the course of the year on the reference from the International Committee on Illumination as to the effect of atmospheric pressure on the light of the hefner lamp. These investigations were made at four different mountain stations.

The accounts show a total net profit on the working for the twelve months ending Nov. 30 of 1,513,621·93 frs. (about £60,544); which is a decrease of about £7415 on the net profit for the preceding twelve months.

The management of the gas undertaking, rendered vacant by the death of Herr A. Weiss on Dec. 16, 1913, has been placed in the hands of Herr Fritz Escher, of Zürich, who had been engaged as Works Manager at the Strassburg Gas-Works. His appointment dates from the 1st of April, 1914.

MUNICIPAL UNDERTAKINGS AND INCOME-TAX.

Alderman Copeland, Lord Mayor-Elect of Manchester, and Chairman of the Finance Committee of the Corporation, referred at last Wednesday's meeting of the City Council to what is known as the Leeds income-tax re-adjustment case. He said it had been the contention of the Committee for some twenty years that the income-tax should be based on the same principle as was applicable to a private firm. The basis of income-tax lay in the fact that, in a private business, if a man had one or two departments, or branches, and one branch made a profit and the other a loss, he was enabled to set the loss against the profits, and make a return on this basis for income-tax. They had all along urged that the Corporation should be treated in the same way; and now, after many years, this contention had been upheld, and they had effected a saving of £105,000 by the Leeds decision.

In answer to a question by Sir Alexander Porter, as to whether the decision affected the future, the Lord Mayor (Alderman M'Cabe, J.P.) said it settled the principle.

THE DYESTUFFS SITUATION IN AMERICA.

In previous issues of the "Journal," reference has been made to reports on the dyestuffs situation in the United States which have been submitted to the Department of Commerce by Mr. Thomas H. Norton, their Commercial Agent. In some noticed in a recent number of the "Gas Age" (New York), he reviews the general situation, and gives the following as the controlling factors.

The stock of dyes of German origin in American warehouses and mills is rapidly approaching exhaustion. Permission for the free passage of two cargoes of German dyes for American consumption—sufficient for two to three months—was granted by the British Government on April 14; but thus far permit for export has not been granted by the German Government. An ample stock of coal-tar dyes, ready for export to the United States, is held by the German manufacturing firms. It awaits the opportunity and assurance of safe transport. The American Government, through the Department of State, is exerting every possible effort to bring about such an understanding with the opposing belligerent powers in Europe, so that free passage may be granted to dyestuffs of German origin destined for consumption by American industries. This effort is earnestly seconded by the agents of the Textile Alliance, formed by the union of five great American textile associations.

Expert opinion regards as highly probable a complete suspension of all imports of German dyes for several months, possibly for the remainder of the current year, if not longer. The importation of Swiss dyes—forming normally about 9 per cent. of the total imports of artificial colours, and exceeding $9,000,000 in annual value—continues in diminished volume. The value during the March quarter of the present year was $191,000.

The existing American coal-tar chemical industry is making every effort to increase its output, and is rapidly overcoming the handicap resulting from its dependence in the past on German intermediates. This output will steadily increase with each passing week. An ample supply of American coal-tar crudes is assured for the prospective needs of dyestuff manufacturers. The American manufacture of aniline and other coal-tar intermediates from American crudes has been started upon a generous scale by all existing dyestuff works, and by five new plants specially devoted to this field. Several other works are in process of erection or in contemplation.

The foundations for a genuine American coal-tar chemical industry are apparently being laid. This industry can supply only a small share of the American demand for the current year, but is susceptible of steady and relatively rapid expansion. No provision is yet made for the American manufacture of alizarin or of synthetic indigo.

American consumers of artificial dyestuffs are promptly taking steps to use natural dyestuffs and mineral colours, during the time that the output of American dyes is necessarily limited. American manufacturers of natural dyestuffs in the form of pastes, extracts, &c., are making adequate preparations to supply the expected demand. They are providing ample instruction in the modern approved methods of using vegetable dyes.

There is a general recognition of the fact that the prospective scarcity of artificial dyestuffs is due to circumstances entirely beyond the control of the American Government and of the American colour industry, and that both are making every effort to lessen the inevitable hardships attendant upon the unprecedented conditions. Consumers of dyestuffs are resolutely adjusting manufacturing processes, so that they may be prepared in time to revert to the use of natural dyestuffs or mineral colours with a minimum of friction, should the necessity arise. Consumers of dyed materials are good-humouredly accommodating themselves to a prospective limitation in the gamut of colours. All sense of hardship disappears before the huge pall of misery and suffering hanging over the countries now engaged in the struggle that has caused this temporary famine in a class of materials almost indispensable to many American industries.

Mr. Norton next deals with the question of the probability of establishing a self-contained American coal-tar industry; and he offers the following observations thereon: The spontaneous effort on the part of American capital and enterprise to meet the exigencies of the present emergency reveals the existence of dormant possibilities of far-reaching importance. Adequate steps have been taken to assure an abundant supply of all the coal-tar crudes needed by a well-rounded American coal-tar industry as fast as the demand develops. A strong effort is being made to establish upon a firm basis the manufacture of a wide range of American coal-tar intermediates. The manufacture of a limited number of staple coal-tar dyes is being pushed with remarkable energy; and the number of these dyes promises to increase steadily. Evidently much has been done during the last few months to lay the foundations of a genuine national industry capable ultimately of meeting the great mass of American demands for artificial dyestuffs.

Unquestionably much of the capital invested during the last few months has, Mr. Norton points out, been in the nature of a speculation. At current rates for aniline and for finished dyestuffs, there was a fair chance of quickly covering the cost of a new plant, of making a good profit, and of being in a satisfactory shape, at the return of normal conditions, to embark in competitive manufacture under favouring circumstances. Numerous interviews with those who have participated in these preliminary steps in the evolution of a national industry have brought to light a marked confidence on their part in the final success of the undertaking provided the capital invested is exposed to no more danger than that involved in fair and open competition with foreign manufacturers of dyestuffs.

Mr. Norton concludes by reviewing the situation in Great Britain.

PROPOSED GERMAN NITRATE MONOPOLY.

[From the "Chemical Trade Journal," Sept. 4.]

The Budget Commission of the German Reichstag has now issued a report dealing with the projected establishment of a State monopoly in nitrogenous fertilizers. It is stated that since the outbreak of war the German production of fertilizers from atmospheric nitrogen has increased enormously—particularly of sulphate of ammonia by the process under exploitation by the Badische Anilin und Soda Fabrik, and of calcium cyanamide; and it is asserted that the manufacturing cost is sufficiently low to enable these fertilizers to be sold at prices below those which have prevailed during the past ten years. It is feared, however, that after the war German makers will have to meet very keen foreign competition; and it is to enable this to be overcome that the scheme is put forward. It is pointed out that Chili has an export duty on nitrate of soda; and the reduction or removal of this duty would make a very important difference to the competitive ability of Chilian nitrate, as against the synthetic products. It is also feared that after the war foreign producers may organize. The German Financial Secretary of State has placed information before the Commission which is said to show that the English and French Governments have negotiated with the Chilian Government with a view to obtaining control of the nitrate industry; and although it has hitherto been impossible to arrive at an agreement on the matter, it is considered by no means impossible that this will be done later. Reference is also made to the North-Western Cyanamide Company. It is stated that attempts were made before the war to form an International Trust which would include this concern, the English interests in Chili, and the American group which controls large water-power plant in the United States and Canada. A price cutting war with this group after the war might prove fatal to German producers; and particularly to producers of bye-product sulphate of ammonia. Those who have objected on the ground that the scheme would result in an advance in prices, and that processes incapable of competing effectively would be protected, are told that maximum prices would be fixed which would not be higher than those prevailing before the war.

DISPUTE AS TO A WATER SUPPLY IN BULK.

A North of England Arbitration.

Earlier in the year, as was briefly announced in the "Journal" at the time, an arbitration took place with reference to a dispute between the Morpeth Corporation and the Tynemouth Corporation, which had arisen out of an agreement for a supply of water in bulk by the latter authority to the former. After a hearing which extended over two days, the Arbitrator gave his award in the form of a special case for the consideration of the Court; and the result was recently announced as being in favour of Morpeth. As the matter is now determined, some fuller notice may be taken of the different points in dispute, and of the arguments that were adduced on one side and the other.

The arbitration proceedings were held at the Surveyors' Institution, Great George Street, S.W., before Mr. A. J. Ram, K.C., as Arbitrator. The Counsel appearing were Mr. Holman Gregory, K.C., and Mr. Scholefield, for the Morpeth Corporation; and the Hon. J. D. Fitzgerald, K.C., and Mr. C. F. Lowenthal, for the Tynemouth Corporation.

Mr. Holman Gregory, in opening the case, pointed out that the dispute had arisen upon the terms of an agreement which was entered into between the two Corporations on July 25, 1905. By this, the Tynemouth Corporation agreed for a supply of water in bulk to the Morpeth Corporation by, and from, a connection to be made with the gravitation main of the Tynemouth Corporation running from their Font reservoir to Tynemouth at a spot on Morpeth Common; and the dispute was in respect of the manner in which the water was to be supplied. Morpeth, he said, was a town with a population of between 8000 and 9000, some twenty miles north-west of Tynemouth. For some years, Morpeth had had its own water undertaking; but it was not now considered by the Corporation to be sufficient to provide, with a margin of safety, for the requirements of the people. As to the Tynemouth undertaking, in 1897 the Corporation purchased the North Shields Water Company; and in the following year they obtained power to take water from the River Font, some thirty miles away from Tynemouth. Power was also secured for the construction of a very large reservoir, with a top-water level 611 feet above Ordnance datum [the ground levels in Morpeth ranging from 84 to 196 feet above Ordnance datum], and the laying of gravitation mains. Further, power was taken in the same Act to supply water in bulk to any councils within ten miles of the main, along its course. As the result of negotiation, Morpeth and many other councils within the area entered into agreements to take an optional supply of water from Tynemouth. It was the consequent written agreement which the Arbitrator had to construe. This set out the price and conditions of supply; and it was clause 4 over which the dispute arose: "That the Morpeth Corporation shall take such supply of water aforesaid from the gravitation main of the Tynemouth Corporation at such place or places in the land called Morpeth Common, belonging to the Morpeth Corporation, as shall be agreed upon. The Tynemouth Corporation shall make the connection; and the cost thereof shall be borne by the Morpeth Corporation." So the Morpeth Corporation were to come and take the supply; and they were to take it from the gravitation main. At a later stage, the Morpeth Corporation requested a supply of water, and suggested that they should tap the gravitation main at that spot, fit up a meter and the necessary valves, and connect the pipe with an 8 inch main of their own, which ran from the reservoir connected with one of their three sources of supply into Morpeth. This was a perfectly simple thing to do; in fact, he believed it was the system which had been adopted in every case in which water had been taken from the gravitation main for supply to councils within the terms of the Act of 1898. The Tynemouth Corporation, however, refused to give this connection, and said that Morpeth must build a receiving well or tank; that they would deliver water from their main into this tank; and that Morpeth must connect the tank with their own main, and so take their supply of water. In other words, what they wanted to do was to rob Morpeth of one of the chief merits of this water—namely, the pressure which was to be obtained by reason of its coming down from the reservoir which was situated some 600 feet above Ordnance datum. This would greatly minimize the value of the water to them, because it meant that the supply would, unless the Corporation provided a pumping-station, or something of the kind, be useful only in the very lowest parts of Morpeth—the spot for the receiving tank being about 200 feet. He suggested reading some letters written prior to the drawing-up of the agreement.

Mr. Fitzgerald remarked that he did not see how letters written prior to the agreement could be evidence for the purpose of construing the agreement. He thought it was settled law that one could not go into any negotiations or correspondence for the purpose of interpreting an agreement. The reason he was rather anxious that the case should be conducted on strict lines was that it was obvious, whatever view the Arbitrator might take, a question of law would arise as to what the proper construction of the agreement was; and it was therefore his intention to ask the Arbitrator to state his award in the form of a special case.

Mr. Holman Gregory said he could not, of course, object to this; but it was rather a pity to add to the expense and trouble of the matter, when they were before an Arbitrator. He thought the Arbitrator was not bound to state a special case.

The Arbitrator: If I did not state one, you might make me.

Mr. Holman Gregory (continuing) stated that in the course of correspondence between the respective Surveyors it was agreed that there should be a 3-inch connecting main from the 18-inch gravitation main to the Morpeth 8-inch main; but later the suggestion of the concrete tank was made, which would have had the effect of breaking the natural pressure from the gravitation main. The original agreement was to supply water in bulk from the gravitation main, which involved it being under pressure. The parties could not decide the matter themselves, and so these proceedings had to be taken.

Mr. Fitzgerald, after some argument as to the admissibility of certain matters, said he agreed, and it had been understood all along, that the Arbitrator had merely to decide the method by which water from the Fontburn reservoir should be transported from the gravitation main into the main of the Morpeth Corporation.

Mr. *James Jardin*, examined by Mr. Scholefield, said he was Town Clerk of Morpeth, and he proceeded to deal with correspondence which had taken place between the parties.

Mr. *John Davison*, Borough Surveyor of Morpeth, in answer to Mr. Holman Gregory, stated that there was no engineering difficulty in the way of making such a connection as his Corporation desired; and if such a connection were made, the water would reach them at considerable pressure, and be available for the whole of Morpeth. Such an arrangement would be likely to be less detrimental to Tynemouth than if the water went into the tank. If supplied as Tynemouth desired, the water would not be available for more than one-half of Morpeth; and there were other objections.

Cross-examined by Mr. Fitzgerald: They were entitled under the agreement, after notice, to take 20 gallons per head per day for the population; but they were not bound to say what quantity they were going to take, or for how long. Even if they gave notice to do so, they were not bound to take any water at all. What they asked for was a connection between the Tynemouth gravitation main and the Morpeth gravitation main. His Corporation were supplying a very few houses outside the town.

Mr. *E. Brough Taylor*, examined by Mr. Holman Gregory, said there was nothing in the agreement which could in any way suggest a tank. The words in clause 4 of the agreement conveyed the meaning to him that the water would be taken direct from the gravitation main under the pressure that was inherent in the water in the main. He had never in a single instance heard of what the Tynemouth Corporation proposed being done; and he saw no reason for it in the present case. It could be no advantage to Tynemouth, while it was a great disadvantage to Morpeth. There was no engineering difficulty in making a direct connection.

Cross-examined by Mr. Fitzgerald, witness said he knew nothing about the Dearne Valley case, in which Counsel said the part about pressure being broken in the case of a bulk supply was before the Courts. He simply spoke of his own practice. If a connection was made by means of a 3-inch main as had been suggested, it would take 24 hours to get 160,000 gallons of water through. Under the construction which Morpeth put upon the agreement, they might keep the valve open for the busy hours of the day, and shut it off afterwards. The supply might be anything up to 140,000 gallons a day. If Morpeth took the whole of the water they required in twelve hours, it would, of course, interfere with the due flow of water in the gravitation main. There were filter-beds just below the Fontburn reservoir; and to take the water from the gravitation main irregularly would alter the rate of filtration, which might be objectionable, though things would be balanced by the subsequent clear-water tank. With the pipe now suggested, it would be impossible to take off the whole 140,000 or 150,000 gallons in twelve hours. A 2-inch main would not give the supply at all. He knew the population was increasing, and that the Corporation were entitled to a supply of 20 gallons per head.

Re-examined: If the system proposed by Tynemouth should be adopted, only part of the town could use the water, so that the 20 gallons per head could never be required.

Mr. *A. S. Dinning*, questioned by Mr. Scholefield, said that as a civil engineer he had had considerable experience of water-works, particularly in Northumberland. In connection with schemes of this kind there, direct connections were customary; and he know of no other. He concurred in the evidence already given, that the Tynemouth proposal would be absolutely useless for the higher parts of Morpeth. In case of fire, it would serve only for the very lowest part of the town.

Mr. *Charles Hawkesley*, examined by Mr. Holman Gregory, stated that there was no engineering difficulty involved in a direct connection. To call for such a connection was not only not unreasonable, but it was contemplated by the agreement. If one considered the quantity of water brought down by the Tynemouth 18 inch main, and the small quantity Morpeth were entitled to take, it was obvious that a direct connection could not be to the detriment of Tynemouth.

Mr. Fitzgerald (in cross-examination): If you, as an experienced engineer, wanted water delivered under pressure, you would say so, would you not, so that there should be no question about it?

Witness: If I had been wanting not to be bound to deliver it under pressure, I should have said so.

Is it a convenient or proper arrangement that no quantity of water is to be specified which is to be taken, and no period during which it is to be taken?—No; that is not desirable. But then we must look at the circumstances. Here were the Tynemouth Corporation trying to outbid the Newcastle and Gateshead Water Company; and therefore they no doubt did not want to put in the needful restrictions.

This method of dealing with water, by which you may take your full supply one day, then no water for two or three days, and then take your full supply on another day, is not either a convenient or a reasonable method of dealing with the water supply?—I should not consider it reasonable; but the parties, when entering into the agreement, apparently did.

Mr. Holman Gregory intimated that this was his case; and evidence for Tynemouth was then called.

Mr. *E. Sandeman*, examined by Mr. Lowenthal, said he designed and carried out the Derwent Valley water scheme. The gravitation main of the Tynemouth Corporation referred to in the present case ran for a distance of 24 miles from the clear-water tank below the filters at Fontburn, to the Moorhouse service reservoir, from which it was distributed over the town. The gravitation main was not designed as a distributing main, but to discharge an even and continuous quantity of water per day into the service reservoir. But it had been so used to some extent since. There was a distinction in water-works between pipes that were intended to carry a continuous flow, and those which were to deal with an irregular flow. In fact, one might say waterworks should be divided into two parts, for continuous and irregular flows. What Morpeth suggested would enable them, in the first place, to take an irregular supply; in the second, to take an undetermined quantity, which might vary from day to day; and, thirdly, it would give them a large pressure over and above that obtainable from the receiving tank proposed by Tynemouth. The tank suggested by Tynemouth was with a view to regularize the supply during the whole 24 hours; and if this were adopted, the functions of the gravitation main would not be interfered with. Tynemouth had no objection, as he understood it, to giving the water; but they did not wish their gravitation main to be really ruined by being converted from an ordinary main delivering water regularly into a distributing main.

The Arbitrator: Is it not so already?

Witness: It is to some extent; but the more it is increased, the worse it gets.

Mr. Holman Gregory (in cross-examination): How does the proposed tank obviate the trouble of irregular supply? Suppose we only wanted water for an hour, you would only supply it through the tank for an hour. Would not that be an irregular supply?

Witness: It would, if it were considered a reasonable thing.

It is a false point to say that supplying through the tank is going to make any difference, or make the supply any more regular, than taking it from the gravitation main?—I agree unless we come to some arrangement as to quantity.

I put it to you that there are already six or seven direct connections, at different places, with this gravitation main?—Yes; and the total population served by them is about 50,000 people.

Re-examined by Mr. Fitzgerald: If the proposed direct connection of Morpeth with the gravitation main was persisted in, the duplication of this main would be rendered necessary much sooner than would otherwise be the case. The cost of the existing gravitation main was about £100,000.

Mr. *J. H. Smillie*, the Borough Surveyor of Tynemouth, having been questioned as to the correspondence which had passed between the parties, and as to what transpired in connection with certain Parliamentary Bills, the hearing was adjourned.

An account of the second day's proceedings is held over.

ANTWERP WATER SUPPLY DURING THE SIEGE.

At the last meeting in London of the Antwerp Water-Works Company [see "Journal" for April 6, p. 17] some particulars were given as to the damage caused by the Germans to the water-works of the city and the efforts made to maintain the supply of water to the inhabitants "Engineering" for the 3rd inst. refers to the difficult task to which the management of the undertaking has been brought face to face and the way their difficulties were, to an extent, overcome. Our contemporary remarks: As the water-works lay in the district through which the enemy advanced, only the water from the Shelde could be relied upon for distribution; but, owing to the influence of the tide, the Shelde water is both salt and muddy. It was therefore necessary to give the water time to settle, before it entered the pipe system. For this purpose, a large dry dock, capable of holding some 30,000 cubic metres, was pumped empty two hours after the commencement of each tide—experience having shown that the Shelde water at this time contains the smallest percentage of salt. After the necessary clearing process, which was accelerated by adding a solution of alum, the water was pumped successively into three other docks of an aggregate capacity of 45,000 cubic metres. In the first dock the water was sterilized by the addition of chloride of lime; and from the last dock it was pumped into the pipe system of the town. The pumping from the large dock into the three smaller docks, and thence into the town pipe system, was effected by several small tug-boats, which otherwise served for fire-extinguishing purposes in the harbour. This emergency water-supply installation was erected in August' 1914, and it was brought into use on Sept. 27; the water-works on the Nethe having been compelled to cease operations owing to the advance of the enemy. It then transpired that the pipe from the docks to the pipe system was not large enough, so that the water could not be sent to the higher storeys of the houses. On account of the bombardment, the installation of a new and large pipe-line from the docks could not be completed; and it was then decided to send the water to the reservoir station at Leuthaagen, and pump it thence into the pipe system of the town by means of the powerful pumping-plant of that station. The water obtained in this manner, naturally, was not fit for drinking; and the people, by poster, &c., had to be warned against drinking it unboiled. After the fall of Antwerp, the proper water-works, which had suffered a good deal, were promptly repaired, and on Oct. 25 the temporary supply from the docks was discontinued.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The lighting of Glasgow streets is to be reduced by one-half after midnight—the purpose of the curtailed illumination being to restrict municipal expense and to make the city less conspicuous from above. The electric lights on one side of each street are to be extinguished at 12 o'clock where the new system is adopted; and the authorities suggest also that motorists can aid the purpose of the modified lighting by disposing of powerful headlights.

A special meeting of the Conveners of the various Committees of the Aberdeen Town Council was held last Monday to consider the situation of contractors to the Council who have been adversely affected by the war. The meeting resolved to make no concessions except in the case of the contractor who is responsible for the transport of gas coal to the city by sea. It was recommended that he should be allowed 8½d. per ton, which represents a total concession of £1079.

The subject of coal contracts for the gas-works was discussed at last Thursday's meeting of the Dundee Town Council, on Mr. Spence moving disapproval of a minute of the Gas Committee instructing the Town Clerk to take whatever action he thought necessary to compel certain contractors to implement their coal contracts. It was pointed out at the Committee meeting, Mr. Spence said, that during four months of the contract no coal had been taken, though tendered; and the Convener, in reply, urged that they had the whole twelve months to take delivery, and it was not necessary that they should take regular monthly quantities. To carry this argument to its logical conclusion, the Gas Department might have refused to take delivery for eleven months, and demanded the whole contract during the remaining one. He moved that the matter be remitted back to the Committee. It would be better to compromise and get half the outstanding balance than possibly be landed in the Courts over it. They had no contract with the Coal Company; their contract was with the local agents, who were quite willing to implement their contract, but could not get delivery of the coal. The Convener of the Gas Committee (Mr. R. M. Noble) moved approval of the minute, on the ground that a principle was involved. It was well known that the Coal Company would not sell direct, but only through their recognized agents. The Gas Department never refused coal. Lord Provost Don said a good deal depended on the question whether the Engineer (Mr. Yuill) at any time during the period declined to take delivery of the contract coal when tendered. So far as the legal position was concerned, the Town Clerk was the proper person to advise. The minute was approved.

On account of the enhanced cost of coal, the Gas Committee of the Aberdeen Town Council have fixed the price of gas for the ensuing year at 2s. 6d. per 1000 cubic feet, which is an increase of 3d.

The accounts in connection with the Aberdeen Gas Department for the twelve months ending July 31 were issued on Tuesday last from the office of Mr. John T. Sorley, the City Chamberlain. The revenue account of the Department shows that after charging £12,019, as the sinking fund for the redemption of mortgages and gas annuities, and carrying £300 to the fire insurance fund, there is a credit balance on the account for the year of £4022, which added to the sum at credit at the beginning of the year, makes £7626 to be carried forward to the credit of the next account. The net liabilities in connection with the undertaking at July 31 amounted to £95,252—being gas annuities held by the public, as valued in 1897 at £154,059. At the present market price, the value of these annuities is £93,780; while the amount of borrowed money, accounts due to tradesmen, &c., is £46,739, being a total of £140,519. The total amount of the capital account is £492,556. The increase in the value of meters is £1383, and in the value of gas-stoves £1202. In the revenue account, which amounts to £149,504, as compared with £149,522 last year, under gas and meter rents, consumers by ordinary meters contributed £73,461, consumers by prepayment meters £24,801, gas-engines £8595, and public lighting £1755—a total of £108,612, compared with £107,197 for the previous year. Residual products realized £38,329. In the expenditure account the manufacture of gas cost £97,884 compared with £109,159 last year, the sum expended for coal being £76,244, as against £82,767 last year—a decrease of £6523. The distribution of gas cost £4754, and rents, feu-duties, and taxes, £9101, while National Insurance was responsible for an expenditure of £202. The total expenditure is £149.504, being a decrease of £17 only compared with the previous year. The balance carried forward from the revenue and expenditure account is £23,634, compared with £11,664. The gas made was 966,768,000 cubic feet, compared with 989,598,000 feet last year.

In the accounts of the Aberdeen Electricity Department for the twelve months to the end of July last the net revenue, after charging £17,755 for sinking fund to pay off mortgages, was £4635. The net liabilities were £221,601, being the amount of borrowed money, accounts due to tradesmen, &c., less the amount due for current supplied, value of stores in hand, &c., £240,601, and less the reserve fund invested £19,000. The capital account amounted to £463,758, compared with £454,453 the previous year. Under this heading there was transferred to sinking fund £138,093, and to the depreciation fund (exclusive of motors), £64,512. The revenue account shows that the sale of current realized £55,740, compared with £56,810, and the hire of motors £3327, against £2889. On the expenditure side of the accounts the generation of electricity cost £16,029, as compared with £17,711 last year. The distribution of the electricity cost £1227, against £875 last year; and rents, feu-duties, and taxes were £6146, against £6107 last year. The revenue and expenditure account amounted to £60,231, compared with £60,353 the previous year—a balance of £32,222 having been carried to the net revenue account. The quantity of electricity generated amounted to 12,475,920 units—this being a record, and exceeding the previous year's quantity by 781,925 units.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Sept.* 6.

Pitch is firm at 26s. net per ton in bulk at makers' works; and it is reported that this price has been established for considerable quantities. Other products are quoted: Solvent naphtha, 2s. 1d. naked; creosote, 4¼d. in bulk; anthracene, 40-50 per cent., 2¼d. per unit, casks free—all at makers' works, net cash.

Twenty-five per cent. sulphate of ammonia remains at £14 8s. 9d. per ton, net cash, in buyers' bags, at makers' works.

Tar Products in the Provinces.

Sept. 6.

There is no alteration in the markets for tar products. The market for pitch is still very quiet, and no transactions of importance are reported. Solvent and heavy naphthas are in fair demand, and prices are maintained. Creosote is quiet, and fair quantities have been offering during the past week at reasonable figures without finding buyers. Crude carbolic and benzol are, of course, commandeered, and the prices fixed.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 3d. to 25s. 3d. Pitch, East Coast, 21s. 6d. to 22s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. Clyde. Benzol, 90 per cent., North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3d. to 3 1/16d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 5d. to 3s. 6d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

Liverpool, *Sept.* 4.

The better feeling experienced in the market last week has become more accentuated this week, and higher prices have been paid at all points for both near and distant delivery. The demand from abroad has not been large, but available supplies have been readily absorbed by middlemen in this country. The nearest prompt values at the close are £14 11s. 3d. per ton f.o.b. Hull, £14 13s. 9d. f.o.b. Liverpool, and £14 16s. 3d. f.o.b. Leith. The views of manufacturers have restricted business in the forward position, but sales have been reported at £14 17s. 6d. for October-December, and at £15 per ton for January-June, at the principal ports.

Nitrate of Soda.

No further change has taken place in the values of this article, and the market has continued steady at 13s. 9d. per cwt. for ordinary quality, and 14s. for refined, on spot.

Sulphate of Ammonia.

From another source it is stated that the market for this article has been exceedingly quiet throughout the past week, and some sales are reported at lower prices. Outside London, makes are quoted at £13 17s. 6d.; Hull, £14 7s. 6d.; Liverpool, £14 10s.; Leith, £14 12s. 6d.; Middlesbrough, £14 7s. 6d.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is quiet—the export branch being affected by the limitation of licences, and by some scarcity of steamers, so that the quantities shipped are barely up to the recent average. In the steam coal trade, this quietness is perhaps the most marked; and there is an effect on the prices. Best Northumbrian steams are quoted about 18s. 6d. to 19s. per ton f.o.b.; but it is believed that a little lower price has been taken when early shipment was possible. Second-class steams are from 16s. 6d. to 17s. per ton; and steam smalls are plentiful at 12s. 6d. to 14s. 6d. per ton. For lack of boats or licences, one or two collieries have had an occasional idle day. In the gas coal trade, the home demand is increasing, and thus the pits are more regular in their working. Best Durham gas coals are from 19s. to 20s. per ton f.o.b.; second-class are 16s. 6d. to 17s. per ton; and "Wear Specials" are from 21s. to 22s. per ton f.o.b. There is not much doing in the way of contracts for gas coals; but a sale over next year at 20s. per ton f.o.b. for best kinds is reported. The output of gas coal is fair under the circumstances, but it will have soon to meet a fuller demand. Freights are steady at 8s. to 8s. 3d., Tyne to Thames—tonnage being in small supply. Coke is active. Gas coke is steady, though with a slight increase in production; and good makes are quoted from 28s. to 29s. 6d. per ton f.o.b. in the Tyne.

Leeds Gas Prices Further Increased.

Intimation was made last week of the intention of the Leeds Gas Committee to recommend the City Council to increase the price of gas for lighting, cooking, and heating purposes 3d. per 1000 cubic feet from Oct. 1, making the price 2s. 8d. for consumers in the city by ordinary meter taking less than 500,000 cubic feet per quarter. In moving a resolution to this effect at Wednesday's meeting of the Council, Alderman Penrose-Green (the Chairman of the Gas Committee) said, with lower prices for larger amounts, for prepayment consumers in the city, the price will be 2s. 11d. per 1000 cubic feet, or 3s. 2d. with a cooker. It might be asked why, when the price was raised 3d. in June last, the Committee did not ask for an advance of 6d. straight away. Their reason at the time was that they were not sure what the price of coal would be. Since then there had been a good deal of controversy; and the Government had fixed the maximum price at a figure which meant an increase of no less than £54,000 to the department in the cost of coal alone. The General Manager (Mr. W. B. Leech) justified the proposed advance in the price of gas on other grounds—the increased cost of material, the increased charge for labour on account of the war bonus, and the reduced price the Corporation would get for residuals. The revenue of the Gas Department for the years ending March 31, 1914 and 1915, showed a deficiency of £49,000; and if the present proposed advance was not sanctioned, the deficiency would be increased by £10,000. The motion was carried without discussion.

Wisbech Lighting Company.—Mr. J. Cockett, presiding at the annual meeting of the Company, referred to the fact that the profits had been seriously diminished through the restrictions which had been imposed under the Defence of the Realm Act. The Directors recommended that a reduced dividend of 3s. 9d. per certificate should be paid—this absorbing £937. The number of private consumers had been well maintained, the undertaking having been very little affected by electric lighting competition. The abnormal rise in the price of coal had made an increased charge for gas unavoidable; the advance having been fixed at 6d. per 1000 cubic feet from July 1. The discount allowed for prompt payment is reduced by 2d. per 1000 feet; and there will also be a discontinuance of the allowance of the usual 1d. in the 1s. for gas supplied through prepayment meters. The shareholders had been the first to feel the adverse effect of the present conditions, as they relinquished a portion of their dividend six months before the price of gas was raised.

Gloucester Gas Company's Profit-Sharing Scheme.—The seventh annual meeting in connection with the Gloucester Gas Company's profit-sharing and saving scheme was held last week at the works; Mr. J. H. Jones (the Chairman of the Committee) presiding. The report stated that the bonus for the year was £613 3s., calculated at the rate of 7 per cent. for the nine months ended March last, and 6 per cent. for the three months to June 30—the price of gas having been raised 3d. per 1000 cubic feet for the last term. The bonus had been divided among the members, who numbered 114. The Chairman, in the course of his comments on the report, mentioned that 17 members of the profit-sharing and saving scheme had joined the Colours. One had been killed, and another wounded. The report and statement of accounts were passed; and the Secretary was instructed to debit every member with a deduction of 5 per cent. from the bonus payable to him this year; the total of such deductions to be paid to the Treasurer of the local branch of the Red Cross Society.

Newark Gas Company.—Mr. T. Bradley, who presided at the recent annual meeting of the Newark Gas Company, referred to the difficulties under which the concern had laboured during the past year. Owing to the increased price of coal and materials generally, the Directors felt it incumbent to raise the price of gas as from Sept. 21 by 3d. per 1000 cubic feet; but even this would not cover the enhanced price of coal, which, in the year just entered upon, would cost £2500 more than in the preceding twelve months. He was glad to acknowledge the loyalty of the staff during the very trying period through which they had been passing. The adoption of the report, which was agreed to, was seconded by Mr. T. Blagg, who expressed the view that the increase in the price of coal to the extent of £2500, which had been foreshadowed by the Chairman, would be the minimum. In addition, tar was not so valuable; and there was likely to be a decreased consumption of gas, while wages and the cost of materials had gone up. The price of gas at Newark was raised in the June quarter from 2s. 6d. to 2s. 9d.; the further increase to take effect during the present month, bringing it to 3s.

A German Gas Company's Report for 1914.

The "Company for Gas, Water, and Electricity Undertakings"—having its head office in Berlin, and operating eight gas-works in different parts of Germany, one in Luxemburg, and one in Holland, as well as four electricity and two water works—has issued its report for the year 1914, in which the following points are of general interest: While the war did not greatly affect the receipts, the working expenses were very much increased. At some of the works, the expenditure on coal was 60 per cent. higher than in the previous year; and the prices obtainable for bye-products did not rise in the same proportion. At Diedenhofen, in Lorraine, the coke-oven works which had recently been supplying gas to the Company shut-down in the middle of August last year; and it became necessary to bring the old gas-works into use again. Towards the end of December, however, the coke-oven works were again able to supply gas. The total output of gas in the year at all the works showed an increase of 5·89 per cent. over that for 1913; but the increased cost of working has compelled the Company to reduce its dividend for the year to 4 per cent.

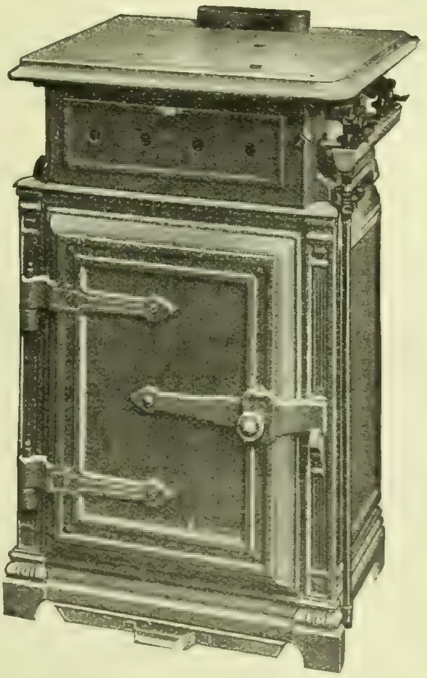
Weston-super-Mare Gas Company.

At the conclusion of the proceedings at the half-yearly meeting of the Company, a visit was paid by the stockholders to the new works, an account of which appeared in last week's "JOURNAL" [pp. 446-8]. The Chairman (Mr. J. E. Norman, J.P.) remarked that the original intention of the Directors had been to have a formal opening; but the war had put an end to functions of this kind. For the business proceedings, no half-yearly report and accounts were issued; the meeting being called for the specific purpose of declaring a dividend. A statement of the half-year's work was, however, made by the Chairman; and this was of a gratifying character. He reported an increase of 13,720,800 cubic feet, or 12·18 per cent., in the sales of gas. For the first three months of the year, from 9000 to 10,000 soldiers were billeted in the town; and the holiday season had led to a great influx of visitors. The increased revenue enabled them, after meeting all the usual charges, to pay the maximum dividends, including the last issue of £15,000, without encroaching on the reserve fund—in fact, a satisfactory balance was carried forward. He had had a summary prepared of the various towns where prices of gas had been advanced through the war—a total of 211 companies giving an average increase of about 6d. per 1000 cubic feet. Though this was not actually complete, as prices were still going up in various parts of the country every week, he was proud to say that theirs was one of eight companies in England who had up to the present been compelled to advance the price of gas 2d. only. The new works were operating very satisfactorily and smoothly; and the Directors trusted that the economies to be expected from them would counteract to a very considerable extent the increased prices they had to pay for raw materials and labour.

Shrewsbury Gas Company.

It was stated in the report which was adopted at the annual meeting of the Company that the profit on the working for the year ended June 30 amounted to £6623. There had been an increase of 8½ million cubic feet in the consumption of gas. Owing to the greatly enhanced costs dating from the commencement of the war, the Directors found it necessary to increase the price of gas to 2s. 11d. per 1000 cubic feet, from the end of the September quarter. Since then continually increasing costs of coal, and all other materials and labour, had compelled the Board to further increase the price of gas to 3s. 4d., from the end of the June quarter. An interim dividend of 2½ per cent. was paid; and the Directors now recommended the payment of another 2½ per cent, making 5 per cent. for the year, less income-tax. The Chairman (Mr. T. F. Poole) pointed out that the year had been one of difficulty. There was no prospect of residuals doing much to meet the greatly increased cost of coal, though the Board had made a favourable contract for tar, and hoped for somewhat improved returns from coke. But in this exceptional time of stress and strain, they must all shoulder the burden which the terrible war had thrust upon them. The reserve fund was nearly all invested in Consols (which they were now endeavouring to convert into the new war loan); and for several years past considerable sums had had to be provided to meet the continual depreciation. But the present slump in price could not be met; and the fund must suffer accordingly. As to the accounts, the utterly changed conditions rendered a fair comparison with recent years impossible. The result of the year's working showed £3556 increased receipts, £4326 increased expenditure, and £770 less profit; and £560 would be taken from the small profit and loss balance to make up the dividend to 5 per cent., less tax. The bad debts had amounted to only 8¾d. per £100 collected. The co-partnership scheme established two years ago had worked satisfactorily so far; and the relations with the employees had been good, though there had necessarily been many changes, through men joining the army. Wherever possible, their places would be open for them if they were fortunate enough to return. Though general expenses were so heavy, the Directors had not allowed any false economy to interfere with their usual practice of keeping the works in a good condition of repair. He felt sure that, with the help and skill of Mr. W. Belton (the Secretary and Manager), and the assistance of the officers and staff, they would be able to carry things through to a successful issue.

Fire at the West Bromwich Gas-Works.—On Friday afternoon, a fire broke out at the West Bromwich Gas-Works; and the fire brigade on arrival found some wood work and coal ablaze. Through the speedy arrival of the brigade and the prompt and effective measures of the Gas Department employees, the fire was prevented from getting anything like a firm hold; and there being a plentiful supply of water, the flames were extinguished before serious damage was done. The cause of the outbreak was a tar-tank overflowing.



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Alliance and Dublin Consumers' Gas Company.

The Directors of the Alliance and Dublin Consumers' Gas Company announce a dividend at the rate of 5½ per cent. per annum, £8119 being placed to special reserve fund; and £10,662 being carried forward. Six months ago the dividend was at the rate of 2½ per cent. per annum. This time last year no dividend at all was paid.

Woking District Gas Company.

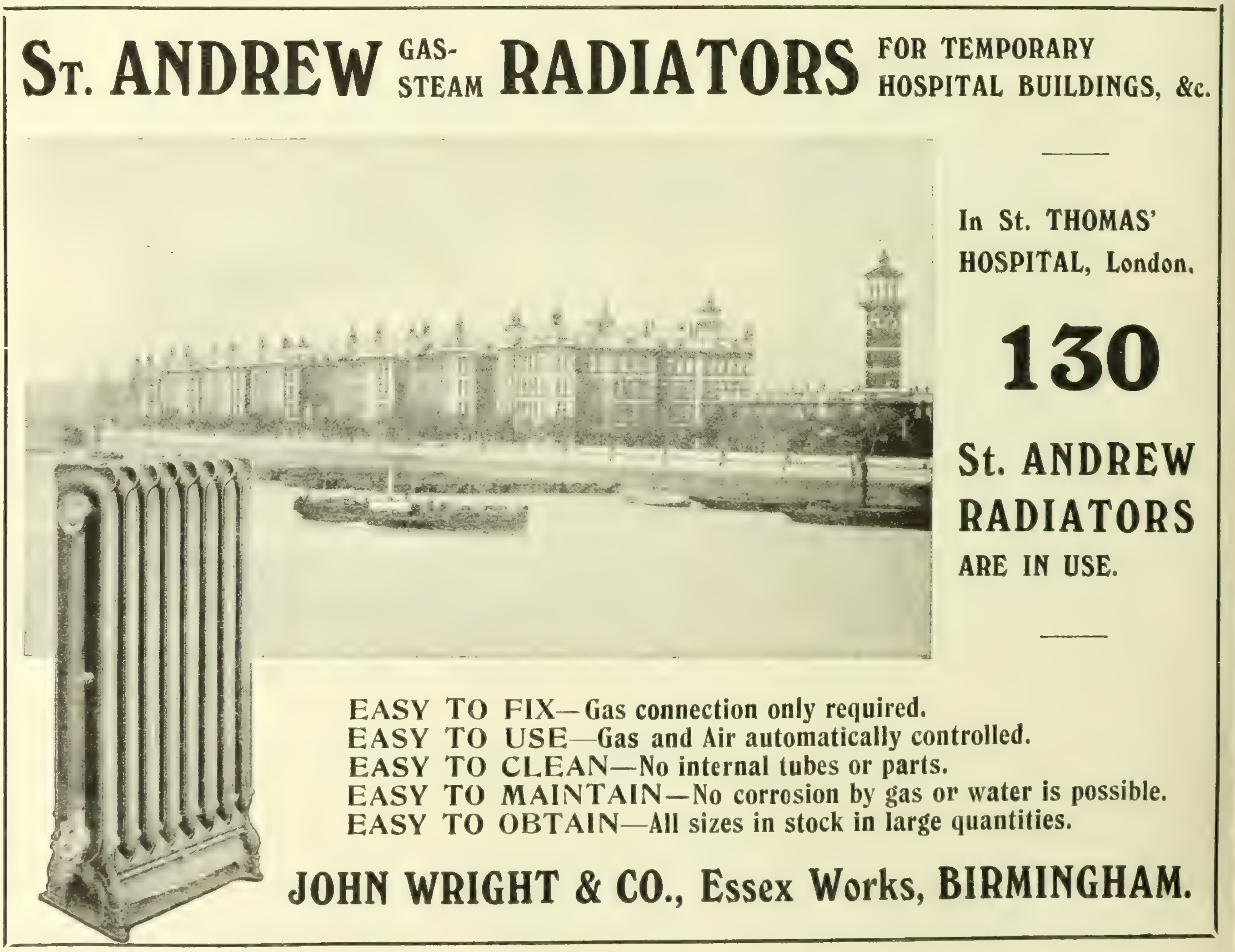
In their report for the half year ended June 30, which will be submitted at the meeting next Monday, the Directors state that the sales of gas show an increase of 1·44 per cent. over the corresponding period of 1914; while the receipts from residual products also exhibit an increase of £248. The coal contracts having been cancelled, owing to the war, the difficulty of obtaining supplies caused great anxiety. Purchases covering short periods were made: and ultimately a contract was entered into to provide for the estimated consumption till June 30, 1916, but at a very considerable increase in the rates paid, in addition to an increased cost of lighterage. In consequence of this increase in the cost of coal, as well as the enhanced cost of all material used by the Company, the Directors felt it necessary to raise the price of gas 6d. per 1000 cubic feet as from March 31. The revenue for the half year has been £10,732, and the expenses on revenue account £8615, leaving a net profit of £2116 to be carried to profit and loss account, to which must be added the balance brought forward from the last account—£6062. After charging £250 interest on debentures and loans, and £21 contribution to the local relief fund, there remains an available balance of £3907. The Directors recommend the payment of dividends on the preference stock at the rate of 5 per cent. per annum, and on the "A" ordinary and "B" ordinary stocks at the rate of 5½ per cent. per annum, which will absorb £1739, leaving a sum of £2168 to be carried forward. In order to meet the growing demands of the district, an extension either of the carbonizing or storage plant had become urgent. The Directors consequently entered into a contract for the erection of additional producing plant, which they were advised was the more economical of the two alternatives. This extension will necessitate the raising of further capital; and an extraordinary general meeting will be held to authorize the issue of redeemable or irredeemable preference or debenture stock.

Read Holliday and Sons.—A private company having this title has just been registered, with a nominal capital of £100 in £1 shares, to carry on the business of dyers, manufacturers of and dealers in dyes, colours, chemical substances, &c.

Price of Gas at Littlehampton.—Owing to the increased cost of coal and all other materials, the Directors of the Littlehampton Gas Company announce a further advance of 4d. per 1000 cubic feet in the price of gas, as from Oct. 1. It has also been decided to suspend the payment of the customary interim dividend this half year.

Weymouth Consumers' Gas Company.

At the half-yearly meeting of the Company, the Chairman (Mr. J. G. Rowe) was able to congratulate the proprietors upon a considerable increase in the sale of gas. It was stated in the report that the demand for gas was never before so high during the first half of a year; the quantity sold being 76,031,100 cubic feet, which was an increase of 9·74 per cent. on the 69,277,700 cubic feet sold in the corresponding half of 1914. Coal, which was the factor that gave the Board so much anxiety during the half year, cost nearly 50 per cent. more than it did twelve months ago. Some of the additional amount spent was caused by the larger tonnage required to produce the increased quantity of gas sold; but the bulk of the addition was due to coal having to be bought outside the contract, owing to the difficulty of getting the contract coal conveyed, and to the abnormal rise in freight charges. About one-third of the additional cost of coal was fortunately met by the better returns from residual products. When recently the question of entering into contracts for coal for the current year was before the Board, it was found that coal could be bought only at such high prices as would render it necessary, in the interest of the stockholders, for the price of gas to be raised. The Directors therefore gave notice that from the end of June the price would be increased from 3s. to 3s. 6d. per 1000 cubic feet to consumers using ordinary meters, and that slot-meters would be adjusted to make the increase in price as nearly as possible the same. Owing to the continued fall in the value of all investments, the Directors had deemed it prudent to depreciate the amount at which the Company's investments stood in the books by £1013, which sum had been debited to the net revenue account. The balance at the credit of this account, after providing for interest on the debenture stock and depreciation of investments, was £6007, out of which the Directors recommended the payment of a dividend on the ordinary stock for the half year at the maximum rate of 5 per cent. per annum. Speaking of the efforts that had been necessary to get sufficient coal to keep the works going, the Chairman said the output at the collieries was reduced, railways were congested, and trucks for carrying coal were at a premium. Added to this, the firm of steamship owners who, before the war broke out, had contracted to supply the Company with steamers, refused to carry out the contract, contending that it was suspended by the outbreak of hostilities. The Directors did not, however, take the same view, and, after prolonged correspondence and negotiation, succeeded in obtaining compensation for breach of contract. For a time they were unable to obtain any steamers, even at the high prices that were ruling for freight; and they were almost at their wits' end to know how to obtain coal enough to keep up a supply of gas, which on more than one occasion they thought would have to be considerably curtailed. In this dilemma they had appealed to the Admiralty, who gave their help by allowing their collier transports to bring the Company three cargoes. The report was adopted; and the efforts of the Manager (Mr. T. F. Canning), the Secretary (Mr. E. Y. Wood), and the staff received cordial recognition.



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Allegations Regarding the Belfast Electricity Works Management.

At the last monthly meeting of the Belfast Corporation, Alderman Tyrrell, in moving the adoption of the minutes of the Electricity Committee, said two rather serious misfortunes had occurred at the power station. One was an accident to the 750 K.W. turbo-alternator, parts of the machine being scattered through the building; and the other a fire, which, however, did not lead to any hitch in lighting or power supplies. Mr. Alexander moved for an inquiry into the origin of the fire, which, he said, was nearly being the most disastrous happening in the history of the city. A little stronger blast, and the entire electric station, with its costly machinery, would have been utterly ruined. The City Electrical Engineer (Mr. Bloxam) said it was all through spontaneous combustion. He (Mr. Alexander) suggested that it was all through incompetence and mismanagement. Mr. R. Johnston, intervening, said this matter should not be gone into to the prejudice of the Council, as the insurance claim had not been settled. Mr. Alexander retorted that Mr. Johnston's attitude appeared to be to deceive the insurance company. He would not be a party to deceiving anyone or concealing anything. Mr. Curley said the men at the electricity station had for months been in terror of their lives, because they knew the machinery was in such a bad state that there might be an accident at any time. The combustion and waste had been going on for several weeks. He had reason to believe that the insurance companies were of opinion that there had been gross negligence in this instance. The disaster to the alternator was due to a like cause. Alderman Tyrrell said, in view of the very serious statements made by Mr. Alexander, it was due to the Corporation that the whole facts should be investigated; and on the understanding that a full inquiry would be held, Mr. Alexander withdrew his amendment, and the minutes were passed.

◆

A Loose Gas-Tap.—At a Stockport gas-poisoning inquest, the Coroner said he had tried the gas-tap concerned; and it was very loose. Probably deceased, in turning off the gas, had accidentally turned it on again. The victim was a soldier, who was found dead in bed at his lodgings, with the gas-tap turned full on. He was said to be a teetotaller, and of a jovial disposition.

Wolverhampton Gas Company.—Mr. B. O. Clark presiding at the meeting of the Wolverhampton Gas Company, said the report was, as usual, very good. A net profit of £15,161 for the half year ended June 30 was shown. Since the last meeting, the Directors had been compelled, owing to the greatly increased price of coal and other materials, to advance the price of gas 3d. per 1000 cubic feet. Dividends were declared at the rate of 3 per cent. upon the preference stock, 5⅛ per cent. upon the consolidated stock, and 3⅛ per cent. upon the new ordinary stock, less income tax. It was further decided that the Directors' fees be paid free of income-tax. Assent was given to the payment of £100 towards the funds of the Red Cross Society.

Hastings and St. Leonards Gas Company.

The 123rd half-yearly meeting of the Company was held last Thursday, when the Directors reported that the accounts for the six months ended June 30 showed a profit balance of £10,363, which, under the exceptional circumstances prevailing, the Directors considered satisfactory. The business of the Company, as was expected, had been adversely affected. The cost of oil, labour, and stores had increased, the higher freightage charge continued, and enhanced prices had to be paid for fresh supplies of coal. As was foreshadowed at the last meeting, it was found absolutely necessary to increase the price of gas 4d. per 1000 cubic feet, which was done as from the April meter-readings. Forty-three of the Company's employees had left in connection with naval or military service. The depletion of trained and skilled workers, particularly in the manufacture department, had necessarily caused the management considerable trouble and anxiety. Circumstances arising from the war had called special attention to the advantages of gas for cooking, heating, and industrial purposes. The Directors recommended the payment of the following dividends (less income-tax), which were at the statutory rates, having regard to the sliding-scale and the increased price: 6 per cent. on the 5 per cent. converted stock; 4¼ per cent. on the 3½ per cent. converted stock; and £5 14s. on the 5 per cent. additional stock. The Chairman (Dr. G. G. Gray, J.P.) said they had passed through a time of intense and ever-increasing anxiety; and it was therefore a great relief when the accounts showed that the half year had been so satisfactory. They had made and sold less gas, and therefore made and sold less residuals; and yet they had £75 more revenue. They used less coal; but the cost of this had been more than £2000 in excess of that in the corresponding half year. A necessary consequence of the enormous increase in the cost of coal, oil, and freight had been the rise in the price of gas. Later on he hoped to have the privilege of explaining how they, and more especially their Engineer and General Manager (Mr. C. F. Botley), had been able to materially assist the Government. The report was adopted; and the officers and staff were thanked for their services.

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Price of Gas at Plymouth.—The gratifying announcement is made by the Directors of the Plymouth and Stonehouse Gas Company that the price of gas will not be advanced during the coming winter. This is contrary to the expectations both of the Company and the consumers; for at the annual meeting a few weeks ago the Chairman (Sir Joseph Bellamy) referred to an increase of price as almost inevitable, and it was generally thought an advance would be made after the close of the present quarter. The price now charged is 2s. per 1000 cubic feet; and in comparison with the cost of house coal, the gas consumers have abundant reason for satisfaction at the supply of gas at this rate. In announcing the Directors' decision, Mr. H. B. Heath (the Secretary) says it is hoped that the arrangements made for regular supplies of coal will be satisfactorily carried through; and thus obviate the necessity of adding to local burdens during the coming winter.

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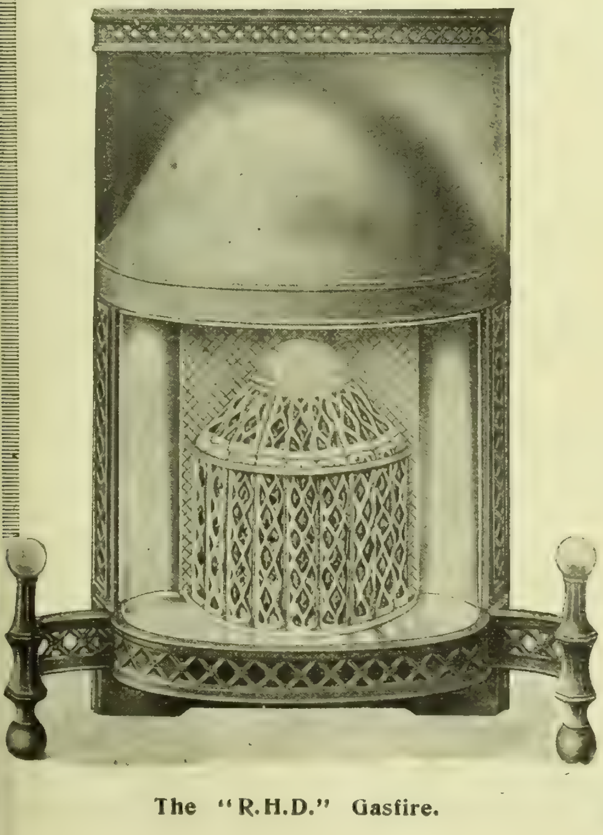

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Cork Gas Consumers' Company.—In moving the adoption of the report [*ante*, p. 469] at last week's meeting of the Company, Mr. W. B. Harrington pointed out that the rise in the price of coal and freights had necessitated an increase in the price of gas. One gratifying feature of the past six months was the substantial increase in the consumption of gas for cooking, heating, and industrial appliances. The development of gas for other than illuminating purposes had been progressive for a number of years; so that the quantity delivered in daylight, instead of being a comparatively small proportion of the whole, now represented nearly 50 per cent. of the total delivery at the same time last year. They had sold 324 cooking and heating stoves, which brought the number of these in use up to 6678, besides many thousands of smaller appliances. For industrial purposes, there had been additional installations of high-pressure gas. A dividend at the rate of 8 per cent. per annum was declared for the half year.

Waterford Gas Company.—Mr. J. H. Sugrue, presiding at the annual meeting of the City of Waterford Gas Company, said there had been a considerable increase in the quantity of gas sold during the year; this being mainly due to the popularity of gas for purposes other than lighting. At present they had about 2000 cooking-stoves fixed out among the consumers, in addition to a great number of fires, geysers, and other apparatus for gas consumption. The rise in the cost of coal had led to an increase of 5d. per 1000 cubic feet in the price of gas; but this would not, by a considerable amount, recoup the extra outlay incurred by the Company through the abnormal circumstances. For some years past, the Company had been paying what was termed the "statutory dividend," which bore a strict relation to the price charged for gas; and, unless circumstances changed much for the worse, they were likely to continue to do so. The report and accounts were adopted, and a dividend was declared making, with the interim dividend, a total of 7½ per cent. for the year.

Redheugh (Newcastle) Gas-Works Ambulance Class.—This class has recently been incorporated in the St. John Ambulance Brigade under the title of the Newcastle and Gateshead Gas Company's Division. It commenced with 26 members—a number which would have been greater if it had not been for the war, as 20 members who held first-aid certificates were serving with the army. Last Thursday evening the inaugural meeting of the division was held in the ambulance room at the Redheugh Gas-Works. Mr. J. F. Fowler, the Superintendent of the division, presided, and Mr. N. Reid, the Manager of the Redheugh Gas-Works, presented the certificates and prizes to the members who passed at the recent examinations. In the first class 22 members sat, and all passed; while in the second class 13 sat and 10 were successful. Mr. Reid also presented a pair of silver photo frames on behalf of the members to Dr. Dougall, of Dunston, in recognition of his services as lecturer. The members of the class also bought a walking stick for Mr. W. Hewitt, the class instructor, in recognition of his services. As Mr. Hewitt is with the St. John Ambulance Brigade serving with the colours, Mr. Reid handed the present over to the Secretary (Mr. W. D. Brown), to forward to Mr. Hewitt.

South Metropolitan Company's War Fund.—Dealing with the war fund of the South Metropolitan Gas Company, their "Co-Partnership Journal" says: At the end of our first year of existence, we have 22 widows and 40 orphans deprived of their breadwinners, besides several parents who were wholly or partially dependent on the earnings of some of our co-partners who have lost their lives in our country's cause. The year's payments to dependants amounted to £20,473. Our casualty list is a long one, and is ever increasing. The Committee have rendered assistance to the wives of our absent ones in many and diverse ways, and are always at their service whenever called upon for advice.

Public Lighting of Dorking.—At a conference between representatives of the Dorking Urban District Council and the Directors of the Gas Company, the latter agreed that it was reasonable the Council should ask for a rebate on the lighting contract for the period during which the lamps were not lit; but they also thought the Council should consider whether they could not meet the Company in connection with the extra price they were now paying for coal, which was very much above what the Company anticipated when they entered into the contract with the Council. The members of the Council have discussed the matter since, and eventually left it to the Roads Committee to get all the necessary information to enable a decision to be come to, and report later to the Council.

Maidstone Street Lighting Regulations.—A report of the Committee on Public Street Lighting containing the following proposals has been adopted by the Maidstone Town Council: (1) That 8 candle power lamps, coloured blue, and fitted with a narrow petticoat shade, be lighted at the junction of streets with the principal thoroughfare, and where else directed by the police. (2) In case of emergency, the Chief Constable be instructed to give definite orders to the Electrical Engineer (*a*) to extinguish the street-lamps, or (*b*) to shut-down entirely. (3) That no gas-lamps be lighted at present. (4) That the lamps proposed to be lighted in clause 1 be extinguished at 10 30, excepting those on the main road through the borough from London to the coast, which will remain lighted until dawn.

Horley Gas Company.—The profit and loss account of the Company for the half year ended June 30 showed an available balance of £1055, after providing for fixed charges; and the Directors recommended the payment of dividends at the rate of 5 per cent. per annum on the preference stock, 4 per cent. on the "A" capital stock, and £2 16s. per cent. on the "B" capital stock, all less income-tax. This would absorb £977, and leave a balance of £78 to be carried forward. In moving the adoption of the report and accounts at the meeting, the Chairman (Mr. Henry Webber, J.P.) said it was extremely satisfactory to note that, owing to the care and attention which had been given to the Company's business by the Secretary and Manager (Mr. R. Seymour Tobey) and the staff during the period under review, it was possible to present what he thought they must all agree with him in saying, considering the times they were passing through, was a most satisfactory balance-sheet.

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Gas Supply Failure at Stone.—Last Saturday week, at about 10.30 p.m., Stone experienced the uncommon mishap of a failure of the gas supply; the interruption, which lasted about five minutes, being due to a hitch at the works. After gradually going lower, the lights died out; and it is reported that "much ready money was spent by slot-consumers who were under the impression that another copper in the meter was all that was needful."

Bolton Gas Committee and Employees' War Allowances.—At the last meeting of the General Purposes Committee of the Bolton Corporation, a resolution of the Gas Committee refusing allowance to the dependants of a workman who had enlisted without the permission of the Gas Engineer (Mr. W. Smith), referred back by the Town Council to the Gas Committee [*ante*, p. 309], was again discussed; and ultimately the Committee re-affirmed their resolution of Aug. 31, 1914, requiring employees to obtain permission to enlist. They instructed the various committees to give effect to this resolution.

Deposit from City Air.—For the purpose of carrying out an investigation regarding the air of the City, the Corporation last year placed a large rain-gauge on a roof in Golden Lane; the rain water from a known area of surface being collected monthly and analyzed. Similar observations are being made by the London County Council on the Thames Embankment. These are stated to be the first definite and tabulated records of impurity in the City air. Dr. Howarth, the Medical Officer, says that in December alone the amount of deposit registered as falling in the City amounted to 54½ tons. Of this mass of dirt, nearly 34 tons were soluble, and included sulphates of ammonia and chlorine, and 20½ tons were insoluble, and consisted of tar, carbon, and grit. No dense fog has as yet been tested. The examination is being continued.

Price Increased at Tonbridge.—The receipts side of the accounts of the Tonbridge Gas Company for the past half year, which were adopted at the meeting last week, showed increases in most of the items, the total income being £12,579, against £12,350 for the corresponding half of last year. On the other hand, the increased expenditure for coal came to £1296. Many of their best men had gone to the front; and the Secretary and Manager (Mr. J. Donaldson) had had a certain amount of trouble with regard to the labour question. But all was now satisfactory at the works. The total expenditure for the half year was £10,638, showing a profit of £1940, and £5455 available for dividends. The consumption of gas had been practically stationary. As to coal, they had had to pay an average of 9s. per ton more than last year, and over 12s. per ton more than two years ago. Owing to this, it had been necessary to raise the price 4d. per 1000 cubic feet, as from the 30th inst. The increase had been postponed as long as possible; and he would point out that the extra cost of coal was equal to an increase of 9d. per 1000 cubic feet. The Directors had, however, decided to utilize the undivided balances which had accumulated in order to meet such an emergency as the present. Last year they had a record consumption; and the fact that they had been able to maintain it was very satisfactory.

Local Government Board and Economy.—Mr. F. H. Tulloch held an inquiry last Wednesday, on behalf of the Local Government Board, into an application of the Skelmersdale Urban District Council to borrow £2000 for the provision of a new gasholder and condenser at their works. Mr. A. Dickinson (the Clerk to the Council) said that, owing to the condition of the works, the township during last winter had been thrown into darkness. The Inspector replied that the Council would have to take the risk of this, as they were living in abnormal times; and the object of his visit was to "squeeze the Council down to the last farthing." He would like to know what they could do without. The Manager (Mr. E. Huntington) stated that if the condensers were supplied he would perhaps be able to manage for twelve months, if the Council would not add to the number of consumers. The Inspector said he would make this recommendation.

Largely Increased Consumption at Colchester.—Brief allusion was made last week [p. 470] to the accounts for the past half year of the Colchester Gas Company. These showed that the amount required to pay the maximum dividends was fully earned during the past six months without any increase in the price of gas, which remains at 3s. per 1000 cubic feet to private consumers, and 2s. 6d. to the War Office. How busy a time the Engineer and Manager (Mr. W. W. Townsend) and the staff must have had will be understood from the fact that the sales of gas for the half year show an increase of 17·42 per cent.; while reckoned on the slot-meter consumption only, the gain was 34 per cent. This gain in total business was secured in spite of a decrease of 5·75 per cent. in public lighting. The cookers on hire last year numbered 1349; this year the figure is 1780. The large increase in the sale of gas is due to two causes: (1) The prosperity of Colchester, owing to the number of troops in the town and the making of munitions and clothing at the factories; and (2) the pushing of the sale of gas and the easy terms granted for the hire or purchase of apparatus.

War Allowances to Gas Workers.—At a meeting of the Special Committee of the Stockport Corporation Employees' War Service Fund, it was reported that a letter had been received from an employee of the gas-works stating that when his wife attended at the Gas Department to draw the Corporation allowance, she was told his wages were more in the Army than he had had at the gas-works, and that there was nothing for her. In view of the resolution of the Council regarding allowances to the dependants of those who enlisted, the writer thought an injustice was being done to his wife and family. It was reported to the Committee that the employee referred to was in the mechanical transport branch of the service, and in receipt of 42s. per week, in addition to his wife's separation allowance of 17s. 6d. per week. The Committee resolved that, inasmuch as he was in receipt of pay in excess of his wages when employed at the gas-works—viz., 30s. weekly—they did not consider him entitled to any allowance from the Corporation. It was further resolved that a return be obtained of all employees of the Corporation in receipt of army pay in excess of their ordinary wages, and of all holding commissions.

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Darkest Germany: Shortage of Gas.—In contradiction to a statement recently reproduced in our columns, the "Maasbode" (an Amsterdam paper), under Saturday's date, states that it learns from Oldenzaal that the question of illumination next winter is becoming a difficult one in Germany, in consequence of the lack of petroleum, gas-meters, and copper for conducting wire. It has been proposed to fix unit prices for gas. The price of petroleum in some places is about 65 pf. per litre. The Government has forbidden German communities to buy petroleum on their own account; and petroleum can only be secured through the Central Purchase Committee in Berlin. Communities mention the quantities wanted, whereupon the Committee calculate the quantity which they may have.

Increased Price at Gloucester.—The increased cost of coal and other materials compelled the Gloucester Gas Company to raise their price 3d. per 1000 cubic feet as from the end of the March quarter; and the Directors in their recently issued half-yearly report announce a further increase of 5d. as from the commencement of the current quarter—a total rise of 8d. This brings the price, however, to no more than 2s. 6d. per 1000 cubic feet, with a discount of 5 per cent. for prompt payment, or 2s. 4½d. net. There has during the past six months been a slight increase in the sale of gas; and the revenue from coke and sulphate of ammonia shows a marked improvement. The payment of the statutory dividend for the half year of 5 per cent. prr annum on the consolidated stock was recommended by the Board.

Electrical Engineers Fined for Bright Light.—At the Bridlington Police Court last Saturday week, the Acting Borough Electrical Engineer (Mr. Frederick Ffrench) was fined £3 for failing to obscure the light from the roof of the engine-house of the electricity works. Two of the witnesses in the case were special constables, who are also members of the Town Council, the East Riding County Council, and of the local Bench of Magistrates; and they testified that the light was dangerous to the works and to the community. At Grimsby, William Atkinson, foreman at the Corporation electricity works, was fined £5 for a breach of the Lighting Restriction Order. The Chief Constable said the lighting had been unsatisfactory ever since the Order had been in force.

The Torpedoing of the "Fulgens."—The current number of the Gas Light and Coke Company's "Co-Partners' Magazine" gives [along with a sketch of the occurrence from particulars supplied] some details of the torpedoing of the "Fulgens," a steamer belonging to the Company, on Aug. 1, off the Norfolk coast, about a mile from shore. The vessel, which was launched in 1912, carried 3750 tons of coal; and up to the time of her destruction, she had conveyed approximately 500,000 tons. As a matter of fact, since the beginning of the war she had made 49 successful trips to Beckton, bringing about 180,000 tons of coal. The ship was torpedoed without warning, and was rapidly submerged; but happily Captain Laird and all on board were saved, though one man was injured. It was at 5 p.m. on the Saturday that the "Fulgens" left Hartlepool; and at 9 o'clock the following morning the torpedo which destroyed her was fired.

Northwich Gas Company.—At the half-yearly meeting, presided over by Mr. C. T. Eachus, a statement of accounts for the six months ended June 30 was presented, which showed that there had been an increased profit of £562 over last year's figures. The gas-rental was reduced by 5 per cent., chiefly caused by the curtailed street lighting—while expenses connected with manufacture had decreased 16 per cent. The Chairman stated that it was a source of gratification to receive such an excellent report, having regard to the awkward times through which gas undertakings were passing; and he expressed pleasure at the large increase of gas made per ton of coal carbonized. Interim dividends were declared of 4 per cent. per annum on the preference shares and 6 per cent. per annum on the ordinary shares.

Reduced Gas and Electrical Consumption at Bognor.—The military restrictions placed on lighting at Bognor have, so the Chairman (Mr. Henry Lovett, J.P.) informed the shareholders at the half-yearly meeting of the Gas Company, resulted in candles being used in many houses in place of other illuminants, in order to avoid prosecutions. The consequence was that the sales of gas had fallen something like 4 million cubic feet. The report which was adopted stated that the accounts showed a balance of £2911 at the credit of the net revenue account. From this sum, the Directors recommended the declaration of a dividend for the half year at the rate of 3 per cent. per annum upon the whole of the stocks, less income-tax. This would amount to £1105, leaving a balance of £1806 to the credit of the profit and loss account. Owing to the continued increase in the prices of coal and oil, the Directors much regretted that a higher dividend had not been recommended; but having regard to the great decrease in the revenue derived from public lighting and the reduced consumption of both gas and electricity by other consumers, they considered it advisable to husband the resources of the Company. The Directors had been, reluctantly, compelled to advance the price of gas from March 31.

APPLICATIONS FOR LETTERS PATENT.

12,188.—Lewis, G. P., "Cracking hydrocarbons." Aug. 24.

12,205.—Acetylene Illuminating Company, Ltd., and Stephenson, A., "Storing gases under pressure." Aug. 24.

12,211.—Atton, J. H., "Prepayment meter." Aug. 25.

12,213.—Simpson, W. M., "Bunsen burners." Aug. 25.

12,258.—Lander, G. D., and Smith, C., "Producing toluene." Aug. 25.

12,278.—Payne, C. R., and Linsley, E., "Vertical retorts." Aug. 26.

12,279.—Payne, C. R., and Linsley, E., "Regenerator bricks." Aug. 26.

12,296.—Smith, D. J., and Towl, C., "Gas-generators." Aug. 26.

12,359-60.—Johnston, J., and the Globe Pneumatic Engineering Company, Ltd., "Rotary exhauster." Aug. 27.

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Street Lighting at Amble.—During a discussion on the question of public lighting by the members of the Amble Urban District Council, the Clerk (Mr. R. Archer) said he had written to the Board of Trade with reference to the position of the Amble Gas Company and the Council. The Company had for years supplied gas for street lighting purposes; and the Council had recently applied to them to supply by meter, which they refused to do, and would only supply gas for street lighting at a lump sum of £200 per year. The Council did not think they were justified in accepting this offer, and applied to the Broomhill Collieries for a supply of electricity for public lighting. The Board of Trade had replied that the Public Health Act, 1875, empowered the Council to undertake the distribution for the purposes of public lighting of electricity supplied to them by other parties. As the Gas Company were non-statutory, they were not subject to the provision of the Gas-Works Clauses Act, 1871; and the conditions for the supply of gas for public lighting were a matter of agreement. Instructions were given to the Surveyor to prepare estimates for the introduction of electricity.

Lighting Question at Halesowen.—The Halesowen District Council, at their meeting last Tuesday, again had under consideration the question of the lighting of the parish. The Cradley Heath Gas Company wrote stating that they were willing to increase their allowance in respect of the lamps which had not been lighted during the winter months, from £50 to £75, and asking the Council to agree to an advance of 5s. per lamp on the contract prices for the ensuing year. The Halesowen Gas Company also sent a letter intimating that they were willing to increase their allowance from £85 to £120, and asking the Council to give them an increased price on the contract for the present season. The Cradley Heath Gas Company stated that, if the lighting was to be restricted by one-third during the winter months, they would be prepared to allow £1 5s. per lamp in respect of all lamps which were not lighted; and the Halesowen Company asked the Council to pay £3 per lamp, and an extra 10s. per lamp for those lighted. The Council decided to rescind a previous resolution for the lamps throughout the district to be lighted in accordance with the contracts.

A Deposit Objected to in War Times.—An applicant at Highgate is reported as having objected, on the ground of "national stress," to the fact that a deposit was demanded of him before he could receive a supply of gas. The Magistrate suggested that the gas company might be afraid he would not pay for the gas consumed. The applicant replied that this might be; but "in these times they must take their chance with other creditors." The Magistrate, granting a summons, said he would have to prove that the company, under their powers, could not demand a deposit. The applicant thought the Courts Emergency Powers Act would help him in his contention that at this time of national stress the company had no right to make the demand.

The Local Government Board have sanctioned the re-borrowing for a period of ten years of the sum of £6200 for the provision of a new holder at the Oldbury Gas-Works.

The firm of Messrs. Biggs, Wall, and Co., gas and general engineers, has been registered as a limited liability company, with a capital of £6000 in £1 shares, 3000 of them being preference shares.

Owing to the fusing of some electric wires, a large portion of the roof over the centre section of the East Greenwich premises of the Molassine Company was damaged. The fire brigade were soon on the spot in strong force; and within about half-an-hour the outbreak was got under.

It may safely be assumed that every reader of the current issue of the "Tonbridge Free Press" will have read through a half-page advertisement bearing the name of the local Gas Company, and relating to the supply of high explosives. The facts brought out are all-important at the present juncture; and the Company's consumers should heed the moral they point. After quoting the "Yorkshire Post's" suggestion that a very proper recommendation from the Parliamentary War Savings Committee would be that people should use gas in preference to other sources of heat and energy, the derivation of toluene is explained, and an appeal is made to "support our men in the trenches by using gas for all purposes."

GAS COMPANIES IN THE STOCK EXCHANGE.

The quiescent character of Stock Exchange business was continued last week, reaching a point approaching inanition on Saturday. The decision of the Committee to keep the House open that day was by no means universally popular. However, quiet as the week was, it was not without some favourable factors. The firmness of Home Government issues and the improvement in War Loan and in Consols were agreeable points; and this was shared by several Colonial issues. Home Rails made some recovery under the influence of the settlement (if settlement it can be called) of the South Wales trouble. In the Miscellaneous group, munitions and other industrial undertakings were strong, especially shipping; the latter being aided by evidence of the failure of the German submarine excursions to achieve any adequate success. Americans, and Canadians with them, were much unsettled by the vagaries of the American exchange, which fell phenomenally on Tuesday to 4·47, rebounded on Thursday to 4·64, and touched 4·70 on Friday. The laying of this stormy factor is an urgent *desideratum*. Movements in other lines were not remarkable. Business in the Gas Market was on the same scale of moderation which has characterized the past few weeks. Almost the only noteworthy feature was that some of the issues which less frequently come into notice were last week the subject of bargains. The general tone was firm; and in some instances the disposition was in favour of higher prices to a moderate extent. In the Money Market, rates were consistently easy for short loans and discounts; but on Thursday, the Banks raised their rates of interest allowed on deposits to 3½ per cent.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 78¾, ditto preference 72½, Primitiva preference 3½, $3\frac{9}{16}$, 3⅝, South Metropolitan 80½. On Tuesday, Gas Light ordinary 78½, 79½, ditto preference 73, San Paulo debenture 88, 88½, South Metropolitan 80. On Wednesday, Alliance and Dublin 59¼, 59¾, Cape Town preference 4⅛, Continental Union 39, Gas Light ordinary 78⅞, 79½, ditto debenture 63½, Imperial Continental 57, ditto debenture 68½, 69, Primitiva $2\frac{17}{32}$, 2⅝, ditto preference $3\frac{17}{32}$, $3\frac{19}{32}$, Tottenham "B" 102¾, 103. On Thursday, Newcastle 85, Primitiva preference 3½, $3\frac{17}{32}$, South Metropolitan 80, 82. On Friday, Gas Light ordinary 78½, 79, 79½, 79¾, ditto debenture 62. On Saturday, Gas Light ordinary 79, 79½, ditto debenture 62, 62¾, 63.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING SEPT. 4.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	59¼—59¾
374,000	"	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7½	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	..
50,000	10	Feb. 26	16	Bournemouth Gas and Water 10 p.c. . .	29—30	5 6 8	..
73,480	10	"	7	B 7 p.c. .	15—15½	4 10 4	..
95,000	10	"	6	Pref. 6 p.c.	13½—14	4 5 9	..
—	—	—	—	Deb. . .	..	—	..
580,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
330,000	"	"	11	Do. New . . .	204—209	5 5 3	..
50,000	"	"	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
206,250	"	June 11	4	Do. 4 p.c. Deb. .	91—93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	"	"	8	Do. A Ord. Stk. .	154—159	5 0 8	..
530,000	20	Mar. 26	12½	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	Do. 4½ p.c. Pref. .	4—6	—	4⅛
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	..
560,000	"	"	5¼	Do. 3½ p.c. do. .	103—105	5 1 6	..
175,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	..
300 000	Stk.	"	4	Continental Union, Ltd.	76—79	5 1 3	39
200 000	"	"	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	..
192,270	Stk.	—	6	Derby Con. Stk. . . .	123—125	4 16 0	..
55,000	"	—	4	Do. Deb. Stk. .	102—104	3 16 11	..
02,180	10	July 29	10	European, Ltd. . . .	17½—18	5 11 1	..
362,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke 4 p.c. Ord. . .	98—102	4 15 6	78½—79¾
500,000	"	"	3½	3½ p.c. max. .	76—79	4 8 7	..
62,235	"	"	4	4 p.c. Con. Pref.	96—99	4 0 10	72½—73
574,850	"	June 11	3	3 p.c. Con. Deb.	72½—74½	4 0 6	62—63½
30,000	"	"	10	10 p.c. Bonds .	..	—	..
358,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16¼—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c. . . .	..	—	..
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C . . .	151—154	5 2 4	..
65,780	"	"	6⅞†	Do. B	115—118	5 8 0	..
65,500	"	June 26	4	Do. 4 p.c. Deb. . .	92—94	4 5 1	..
40,000	Stk.	May 14	9	Imperial Continental .	150—160	5 12 6	57
235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	68½—69
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c. .	119—121	5 7 5	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. A	211—213	4 13 11	..
718,100	"	"	7	B	146—14	4 14 7	..
06,083	"	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	..
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd. . .	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	98½—99½	4 10 6	85
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	..
300,000	Stk.	May 14	8	Oriental, Ltd. . . .	117—122	6 11 2	..
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .	7¼—7¾	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B . .	128—131	4 19 8	..
100,000	50	"	12	Do. C . .	118—121	4 19 2	..
52,000	50	"	10	Do. D . .	..	—	..
249,980	5	April 29	8	Primitiva Ord. . . .	5½—6	6 13 4	$2\frac{17}{32}$—2⅝
499,960	5	June 26	5	" 5 p.c. Pref. .	4¾—5	5 0 0	3½—3⅝
521,600	100	June 2	4	" 4 p.c. Deb. .	91—93	4 6 0	..
—	—	—	—	" " " 1911	..	—	..
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	5 p.c. Deb.	47—49	5 2 0	88—88½
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 3	..
209,984	"	"	10	Do. B	222—224	4 9 8	..
523,500	"	"	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African . . .	10½—11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	80—82
1,895,445	"	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	..
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 8 5	..
60,000	"	"	5	Do. 5 p.c. Pref. .	110—112	4 9 3	..
—	—	—	—	Do. West Kent. .	..	—	..
137,058	"	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord. . .	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c. .	135—138	5 8 8	..
742,275	"	"	6†	B 3½ p.c. .	115—117	5 2 7	102¾—103
181,255	"	June 26	4	4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	"	"	6⅞	" B 3½ p.c.	129—134	5 2 7	..
108,075	"	"	5/17/3	" C 3½ p.c.	110—115	5 2 0	..
352,000	"	"	6⅛	Wimbledon 5 p.c. .	117—122	5 0 5	..
98,000	"	"	6⅝	Epsom 5 p.c. . . .	121—126	5 5 2	..
88,416	"	June 26	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Lady Canvasser. No. 6090.
Coking and Bye-Products Works Chemist. No. 6085.
Gas-Works Chemist. No. 6086.
Chief Clerk. No. 6088.
Draughtsman. No. 6089.

Appointments, &c., Vacant (*continued*).

Educated Ladies for Gas Show-Rooms. No. 6087.
Foreman. East Hull Gas Company.
Gas-Fitters. Swansea Gas Company.
Slot-Meter Collector. Oldbury Gas-Works.
Fitter. No. 6084.

TENDERS FOR

Tar.

Clonmel Corporation Gas Committee. Tenders by Sept. 30.

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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VOL. CXXXI., No. 2731.] TUESDAY, SEPTEMBER 14, 1915. [67TH YEAR.

EDITORIAL NOTES.

Common Aims and Mutual Dependence.

If Professor Schuster had searched the whole realms of science and general human affairs, he could not have discovered a subject more apposite to the times than the one he chose for his Presidential Address last Tuesday to the British Association. Superficiality has greater prevalence than profound thinking; and superficiality breeds wrong conceptions, and supplies vast ground for the existence of false beliefs. Professor Schuster has performed the good service of helping to arrest the progress of those ideas that individualize rather than unify the interests of life. It would be better if we all realized that our affairs have not that distinctiveness and isolation with which we sometimes mistakenly try to invest them. In this, and in becoming obsessed by the importance of one's own domain in life, there is the danger of losing the sense of mutual dependence. Before the war, it is to be feared, superficiality had allowed the danger to assume the form of a real fact, with constantly swelling proportions. "But in the shadow of a "great catastrophe, it has been brought home to us that the "clash of interests is superficial; and the slender thread of "union which remained has grown into a solid bond." Now under the surface one sees a unity of purpose and sentiment among the heterogeneous elements into which the community was outwardly divided.

Such thoughts as these open the mind to contemplating the immensity of the error which draws lines of demarcation between the common interests and affairs of life. To fully appreciate the error, vague generalities must be dismissed, and deeper thought be brought to bear. We get, for example, sharp divisions made by the unthinking between science and business and between theory and practice; while, as a matter of fact, such divisions do not actually exist. They are mutually related; the one cannot do without the other. As Professor Schuster says, we get one man calling for the conduct of affairs on business lines; while another clamours for scientific methods. They either want the same thing or they talk nonsense. What are business lines? "Business lines" are not those haphazard rule-of-thumb methods that may or may not end satisfactorily. They are the lines that are adopted with the definite view of attaining correct results; and "every method," our presidential philosopher points out, "that leads to correct results "must be called a scientific method." It is quite possible to discount reasoning of this kind by calling to the aid extremes in contrast. That, however, is the old artifice of those who know their case is weak, or who are too obstinate to admit that superficiality and not depth of thought is the characteristic of their convictions. Those who senselessly pooh-pooh the companionship of science and business, separating them as things that have no affinity, and are incapable of synthetic treatment to the attaining of correct ends, have little, or rather no, conception of the doctrine of mutual dependence which rules here as in the other affairs of life. The same with theory and practice. It is a fatal distinction, says the President, which puts men of theory in opposition to men of practice; the obvious truth being that nothing of value is ever done which does not involve both theory and practice. They only come into opposition when one or other of them is at fault.

The vast organism which represents the life and interests of a nation is something of a very complex nature; but there is mutual dependence between every part. Every part too —every institution, every factory, every business establishment—is in itself a complicated organism. But all the separate organisms have an interdependence. Professor Schuster urges us to make the best use of this common condition, and apply to the work all the ability the country possesses. We are a nation that has acquired, and has maintained, a great empire; we have immense wealth; we conduct a vast trade in all parts of the world; we have a Navy of a power envied by our enemies; we have raised a new and immense Army in a few months, and have equipped it for the field. No one can say that Great Britain has not ability, organizing power, resource. It is not defective in any way in these as possessions. But where we have failed, and proved a deficiency, has been in bringing those possessions under proper discipline, and in exercising them nationally. The work that has had to be done in connection with the war—the formation of the Munitions Department, the passing of the National Registration Act, the formation of the Coalition Government, the establishment of British Dyes, Limited, the passing of certain coal-regulating legislation—points the accusing finger to neglect in making proper use in all directions of our resources and organizing power. All the Committees established by the Government simply mean the introduction of the, in relation to the country's affairs, new factor—discipline, and raising the much ignored common interdependence on to the higher and more prominent plane of acknowledged fact. We do not, however, want the cast-iron discipline as moulded by Germany; we want something with a little more freedom about it than that. Where liberty of movement is completely eliminated, there exist limitations to advances to the best effects. Even discipline requires to be tempered by an amount of latitude.

Professor Schuster has placed his finger on the weak spots in this country's methods—the want of a complete recognition of the common dependence of interests and affairs, and the past indifference to the utmost use being made of a great organizing ability. He occupied a platform from which he could direct general attention to these things; and we hope, despite the war, and the diversion of attention from normal affairs by air raids, that his message and advice will prove efficacious in the promotion of the end he and all with the welfare of the country at heart have in view.

The Chemist and Fuel Economy.

Called at short notice to the chair of Section "B" (Chemistry) of the British Association, Professor W. A. Bone, D.Sc., F.R.S., gave an address which had a double purpose. The first was to present a critical review of modern work in relation to flame and combustion; and the second, to arraign the Government, industries, and chemists for the prevalent terrible prodigality in connection with fuel consumption, and to urge that there should be systematic supervision under a central organization begotten and authorized by the Government. The review of the work latterly done in regard to the phenomena accompanying the ignition temperatures of simple and complex gaseous mixtures, as well as those relating to gaseous explosions and kindred subjects, was made in the skilful manner of which alone a master and constant student of such subjects is really capable. We have published the review in order that there may be on record an authentic digest of the present state of knowledge on these questions. Incidentally, it is remarked that among the schemes of work which Professor Bone has mapped-out for the new department over which he has control at the Imperial College of Science, is still included the one (noticed at the time that we described the new laboratories and their excellent equipment) from which he hopes to derive data as to the speed of flame propagation through mixtures of various combustible gases—not only at ordinary temperatures and pressures, but also when the mixtures are heated and used at higher pressures; and to ascertain whether, in the case of complex mixtures of combustible gases and air (coal gas and air, for example), the velocity of flame propagation can be calculated from the known velocities for its single components. Such information would be of considerable practical value in connection with the development of apparatus for burning explosive mixtures of gas and air. But the research will need much organization and expert direction, and money will be required for it. Hence the appeal of

Professor Bone, which awaits response: "Who will help us "with the necessary funds?"

Important though all the constituent subjects of the review are to progress, immediate interest and value lie in the great economic question that Professor Bone raises in connection with fuel consumption. Statistics have been liberally provided as to the available quantity of our native stores of coal; and we may either accept or reject them at will. Whichever we do will not have the slightest effect. The fact remains there is a limit to the stores; and we have no right to rob those who will come after us by prodigality in these times. We know approximately the present annual rate of the consumption of coal in the country; but Professor Bone asks in effect, if not in words, is this rate of consumption necessary in relation to the work done? His reply is that it is not. In various industries he sees immense waste going on, both in fuel and in the valuable constituents of that fuel—a waste which he drives home by telling us point-blank that it would not be, and is not, tolerated in Germany. It is not pleasant to be told that the arch enemy does things better than we do them in this country; but the truth of it should impel to better conditions here. However, the blame for the existing waste in industry is well distributed in the address. The manufacturers and those who control industries (Professor Bone paid a compliment to the gas industry for what it has done in obtaining good value from the coal it carbonizes) are at fault; but the whip was also applied freely to the shoulders of chemists and scientists who have so largely neglected the question, and have so commonly ignored the considerable area provided for research by the carbonization of coal and the resultant products. The work that has been done has been left in the hands of the few; and yet here is a fundamental field upon which much of the superstructure of chemistry stands. Engineers have wrestled with, and made the best use of, their conditions, while chemists have mainly stood aloof, when they might have intervened in a manner which would assuredly have meant greater economy, progress, and profit. The time is now especially opportune for the chemists to make amends, and bring their influence to bear on the waste of fuel and other valuables when the country has at length awakened to the fact that, by chemical agency and supervision, Germany was succeeding well in its initial efforts to depose Great Britain from its industrial and commercial supremacy. The domestic waste of fuel was also mentioned by Professor Bone; but the industrial waste is the more amenable to supervision and control.

For example of waste, Professor Bone went direct to the coke-oven industry; and much of what he had to say in this connection cannot be disputed, though it will hardly be palatable to those who own, and those who have the responsible charge of, coke-oven plants. He urges the need of better and more systematic control of bye-product plants; and we fear there is much truth in what he says that, in far too many cases, the training and the subordinate position of the chemists employed in association with such plants are not what they ought to be in what is fundamentally a chemical industry. "I can say, from personal knowledge," remarked Professor Bone, "that plants which are managed and controlled "by experienced chemists of broad training, combined with "force of character, yield much better results than those "controlled by men without such qualifications." Apart from economic considerations, lack of efficient control has strong reflection in the comparatively little use that has been made of the University Departments of Applied Chemistry which specialize in fuel. While there is this impeachment of the working of a large part of bye-product coke-ovens, the waste of beehive coke plants is infinitely worse. In these is carbonized about one-third of the 20 million tons of coal coked per annum in this country (apart, of course, from the equal quantity or thereabouts used by the gas industry); and this one-third part represents a considerable waste of valuable constituents of the coal. Here comes in Professor Bone's first recommendation, which is that public interest would justify the Government in fixing by law a reasonable time-limit beyond which no beehive coke-oven installations should be allowed to remain in operation, except by the express sanction of the State, and then only on proof of special circumstances.

It passes strange, with such a palpable waste of fuel in industry, that no organized body of scientific men thinks it is worth while to take an active interest in trying to bring about its suppression. In extenuation, however, it may be said that scientific men more generally concentrate attention upon the investigation of a single detail of a subject than on a broad economic question such as that which Professor Bone raises in his address. Probably the reason for this is that these men are not brought into contact with the actual work of industry the same as a man of science like Professor Bone, whose research work in relation to fuel has been peculiarly interlinked with industrial operations. Perhaps, therefore, something may be advanced in palliation of the neglect of others. The line of action is for one in their critic's position to stimulate interest, so as to obtain from them a following, and to press forward with their aid to the goal in view. If this goal can be attained, an inestimable national service will have been accomplished. Fuel economy means national economy. So this is a national question; and the Government ought to be fully aroused to its importance by the deliberately used words: "It is "tolerably certain that, with an efficient system of public "supervision of fuel consumption, we ought to be able, even "with existing appliances, to save many millions of tons of "our annual coal bill, and with improved appliances still "more millions—a saving which would in the long run "redeem a considerable amount of the War Loan, which "has been much more easily raised than it will be repaid." There is something here for rumination and action by our statesmen and economists, who babble about small domestic economies when a huge economy is to be effected by war on the immense waste of fuel that is proceeding daily. Only the Government can make any effective move in this matter. And the capital recommendation in the address is that the Government should be memorialized with a view to the establishment of a central organization for supervising fuel consumption and the utilization of coal somewhat on the lines of the existing alkali works inspection, which has been so beneficial to the chemical industry. Furthermore, it is suggested that, in connection with such an organization, there might be undertaken a much-needed chemical survey of British coal-fields, as well as experimental trial of new inventions for the promotion of fuel economies. The idea is good; but even good ideas fall to the ground unless persistently upheld by protagonists who are not discouraged by slow progress—such as Sir George Livesey with the co-partnership system. We hope that the address by Professor Bone is not the first and the last we shall hear of a movement for systematically effecting a national economy from fuel waste. Opponents may be found in those with coal for sale; and manufacturers are difficult people to shift from custom. If economy will not sufficiently appeal to them, there should be other ways and means of compelling the application of efficiency in the expenditure of fuel.

Calorific Power and Benzol.

The Government have commandeered the whole of the benzol production of the country; and those motor-car owners who have been using benzol, and have experienced the excellent mileage results per gallon, are extremely sorry for themselves that supplies are denied them, though not complaining in view of the purpose to which for the time the material is being put in the national service. We have had inquiries from dealers asking whether there are any producers who are free to supply their needs, but there is only the one answer. However, the fact is the country is not getting all the benzol that is possible; and the position and demand to-day make it more reasonable than ever to point out to the Government that, if they would only do as Canada has done (as shown last week), make calorific power the universal standard for gas, instead of waiting for the change to be made as gas undertakings come to Parliament (which will mean leisurely change proceeding over a score or more of years), the gas undertakings could well increase the output of benzol, and this without inflicting any great hardship on the consumers. Of course, we should hear again of the flat-flame burner user, who some gas engineers defend as though he was one of their own progeny, instead of an obstructionist in the path of progress and the greater utilization of the resources of the gas industry. Naturally, the removal of a larger quantity of benzol from the gas than is done at the present time would result in a small percentage injury to the calorific value of the gas; but the percentage is so relatively small that it would not be appreciable to the consumers.

Wherever we look there comes corroboration of this. Early in 1913, Mr. W. J. A. Butterfield pointed out that, while the luminosity of the gas would suffer to a larger extent, the calorific value would only be depreciated by between

5 and 6 per cent. And now Mr. W. R. Herring (who is of opinion that to-day the question of benzol extraction from gas should be faced as a national, and not as purely a commercial, one), in an article in other columns, gives us the results of washing gas by unbenzolized wash-oil and prebenzolized wash-oil. With the former 16·11-candle gas ("Metropolitan" burner) was reduced to 10·51 candles—a loss of 34·7 per cent. of luminous value. But the gross calorific value, 585·3 B.Th.U., only suffered a 4·5 per cent. depreciation, or to 559·1 B.Th.U. With the prebenzolized wash-oil (with 5 per cent. of benzol added), the illuminating power was only reduced from 16·08 to 15·06 candles, or about 6·34 per cent., while the calorific value was reduced from 579·4 to 576 B.Th.U.—a loss of 0·58 per cent. The figures, however, which are important at the present time are those obtained when using unbenzolized oil; and, as Mr. Herring points out, the comparatively insignificant loss of calorific value when using such wash-oil must forcibly strike all gas engineers. The experiments go to prove that a large proportion of the benzol can be removed from gas, and still leave a candle value sufficient to give some luminous effect when burned as a naked flame, while only depreciating the calorific value by the small amount shown. Upon these results, Mr. Herring suggests that it is in the hands of the Government to enable the gas industry to be of even greater public and national service than it is to-day, and accomplishment is through the universal application of a reasonable calorific value standard, and freeing the industry from the incidence of the luminous flame test.

The war is producing a vast amount of change in the methods of the country and of its industries; and some of this change is going to be permanent. There is not the slightest reason why the change should not include the universal application of a reasonable calorific value standard, so as to put gas undertakings in the position to better serve the country.

Difficulties of Standardizing Illumination.

DURING the past week, there has been more time available than previously to examine the report of the Home Office Departmental Committee on Lighting in Factories and Workshops; and now, although this is only the first report, it may be asked, upon the strength of the information contained in it, whether there is any prospect of the Committee being able in the final result to prescribe exact standards of illumination for factories and workshops, under the incalculable variety of work, eyesight, and environment to be found in such places? On the showing of the report, it is pretty safe to say that the time is far distant when anything of the kind will be accomplished; and it may be doubted whether such a consummation will ever crown the work in hand. All that now seems possible is for the Committee to generalize; and generalization can only be directive and not definitive in its application. While saying this, we are not suggesting that there is no value in the work the Committee have been carrying on, and in the large accumulation of information presented to those concerned. It is all to the good that this should have been brought together, because we know it to be a fact that there are many factories very imperfectly illuminated, and that this condition of things contributes to accidents, is harmful to vision, and cannot be conducive to the best outputs, quantitatively and qualitatively. If the work of the Committee produces improvements without absolute standardization, good will have been achieved.

The report is practically a confession on the part of the Committee as to the impossibility of getting beyond a state of generalization in the matter of prescription. The Committee themselves declare that they only feel justified in recommending that requirements in general terms for adequate and suitable lighting should be applied to all factories and workshops; and later on they show the limitations which they have come up against by saying that "lighting " requirements vary so much that each trade, or even each " process, must be considered on its merits, and a standard " of anything like general application is possible in well- " defined circumstances only." The complex conditions which the Committee find blocking the way to giving a complete finish to their work have evidently been experienced by other countries, some of which seriously took up the matter of the better lighting of factories and workshops long before we did at home. But though it is not a new subject with them, they have got no further than the prescription of "adequate lighting," which is a term that is beautifully elastic, and rightly so; for lighting which is "adequate" wobbles about in degree according to the conditions of occupation. The countries in mind are Austria, Belgium, Denmark, France, Germany, Holland, Italy, Norway, Sweden, and most of the United States. Only in Holland has an attempt been made to define values as minimum standards of illumination; and these merely apply to fine work. But it further attests the great difficulties of the matter when it is learned that even these standards for fine work have recently been doubled, which does not say much for the first attempts at prescription. In Belgium there is also prescription against excessive glare. In the Indian Factory Act of 1911, the Inspectors have power to require "adequate" illumination; and a definite standard for general lighting in factories is in force in New South Wales. There we stop in the matter of precedent; and beyond the possible adoption some day of compulsory "adequate" lighting for factories and workrooms in this country (probably with penalties for default), we doubt very much whether we shall ever go. At any rate, the report does not encourage hope.

What is "adequate" lighting? The Committee are not in a position to define it; and the attempt they have made at some sort of explanation is loose and uncertain. That the Committee feel that this is a characteristic of their recommendations is shown by their admission that they are fully aware that, until it is possible to define standards, difficulties may arise from time to time in the enforcement of the requirement. However, adequate lighting, they say, should include: (1) A "reasonable" degree of constancy and uniformity of illumination over the necessary area of work; (2) the placing and shading of lamps should be effected so that the light from them does not fall directly on to the eyes of the operator when engaged on his work, or when looking horizontally across the workroom; (3) the disposition of lights should be in such manner as to avoid the casting of extraneous shadows on the work. The loopholes here for dissension between inspectors and factory owners are plentifully provided, not through any lack of competence on the part of the Committee, except that none of the members, so far as we are aware, have any practical experience as factory owners, as managers of factories, or as workers in them. Their inability to arrive at something more definite is due to conditions so complex as to be unamenable to a common law. For general illumination, the Committee do venture upon a prescription, which they recommend for adoption. Over the working area of workrooms, they suggest that the illumination, measured on a horizontal plane at floor-level, shall be not less than 0·25 foot-candle, without prejudice to the illumination required for the work itself. "Without " prejudice" is a term in this connection that is a bit ambiguous. We take it this 0·25 foot-candle is intended to be the minimum, independent of the local lighting required for the work itself, and which local lighting is not always uniformly in existence. But the local lights when in use would fortunately supplement the general illumination—"fortunately," for in places where there is moving machinery and ground surface pitfalls the 0·25 foot-candle rather errs on the wrong side. Then in all parts of iron foundries where work is carried on, or over which any person is ordinarily liable to pass, the illumination, similarly measured, it is proposed shall not be less than 0·4 foot-candle. In all other parts of factories, the suggested illumination is not less than 0·1 foot-candle; and in open spaces not less than 0·05 foot-candle, which is absurd as a general prescription. In some of the open spaces of factories of which we know, there are railway lines, awkward points and curves, and shunting equipment; also spirited little locomotives (sometimes full-sized ones) and railway waggons moving about at all hours of the night. There are underground hoppers for the reception of coal and other material, to fall into which has unsatisfactory results; and there are numerous other obstructions and traps for wayward feet. Yet the Committee would be satisfied with the illumination of these open spaces if not less than 0·05 foot-candle!

In order to make investigation as to the quantity of local light required for various operations, experiments have been instituted at the National Physical Laboratory; but the fact that the research has not yet got further than seamstresses and tailors shows that the Committee have something in hand in regard to which it will be a miracle if they can ever claim to have reached perfection. Differences in condition of work and eyesight, character and colour of work, impose obstacles to the specifying of any exact illumination. What is clear is that each worker should be provided with a light with a good range which he himself can regulate according to the nature of the work on which he is engaged, and to suit his own eyesight. The Committee have not included this provision in their general recommendations; and yet obviously it is the most sensible thing that could be done, instead of saying to a man: "The light you require is 1·25 "foot-candle for that work, or 4, 5, or 6 foot-candles for "that work." The man would not perhaps express in words what he thought. However, in tests at the National Physical Laboratory, the conditions were not factory or workroom ones; and the number of investigations that could be carried out under such conditions is limited, as well as is the value. The conditions, for instance, would not apply to factories or workrooms in which there is moving machinery, and vibrations result; and the beautiful atmospheric circumstances of Bushey are not what are found in the most populous parts of the land where seamstresses, tailors, and other people are employed. Electric metal filament lamps were used in the experiments—variously, with direct lighting with opal shades to the lamps, indirect lighting, and shielded lighting with the lamps enclosed in aluminium shades of parabolic form. Electric lighting was adopted, it is stated, on account of the ease with which regulation can be effected for experimental laboratory purposes—in other words, by inserting resistances any degree of illumination could be secured up to a maximum of 12 foot-candles. It seems to have been overlooked that a gas-tap is an excellent means of regulating light. Anyway, the experiments prove the impossibility of specifying any one standard of illumination. The persons who acted as the mediums for the investigators, under strange conditions, came to the conclusion that 1¼ foot-candles were sufficient for white material; and though they stated that 4 foot-candles were ample for black material, they thought that, for comfortable operation, 5½ foot-candles would be better. Shades between these extremes in colour required other quantities. This being so, workpeople having different eyesight, and factory and workroom conditions being different, it points to an adjustable system of lighting being the best. One other point is that the figures provided by the Bushey experiments are not those that would be required for local lighting in a factory where a good general system of illumination prevailed, which apparently was not the case in the test-rooms. That is a distinct factor to be taken into consideration in workshop and factory lighting.

One thing the experiments do, and that is to sound the death-knell of indirect lighting for most workroom occupations. The seamstresses and tailors all preferred direct lighting with shades, so as to keep their eyes free from glare. In every case the indirect lighting was condemned as inadequate, and the illumination had to be increased—in one case by 100 per cent., in others by 40 per cent. In distinguishing detail, too, a considerably greater illumination was required than with direct lighting. Under such circumstances, indirect lighting will not be readily accepted as an economical and useful lighting agent; for factory owners do not want to use 40 to 100 per cent. more current than is necessary for adequacy, nor do they want to incur the concomitant expenses of the system and of the increased number or larger unit lamps requisite. On these points, the tests at the National Physical Laboratory are confirmative of what was already known, and what would suggest itself to any intelligent person who set himself to consider the relations of illumination to work of varied kind, and executed by people with dissimilar vision in different circumstances. On many other points, the work at the laboratory is certainly educative.

However the deeper one penetrates into the report, more and more magnified become the difficulties that face the Committee in trying to make rational illumination prescriptions for a mass of contrary conditions.

Public Retrenchment and University Efficiency.

ECONOMY is in the air; and the Government have appointed a Committee on Public Retrenchment. One result of the work of the latter will be that those people who are interested in, and who may be adversely affected by, their recommendations will think the Committee very foolish and incompetent; while those who are interested but are left undisturbed will find no cause, under the circumstances, to quarrel with the Committee's proposals. But there is one direction in which all intelligent men will agree that it would be wrong, and inimical to national interests, to start economizing, and that is in connection with the work that is now being performed by our new universities—for example, Manchester, Liverpool, Leeds, and Sheffield. To reduce expenditure, and to call it "economy" when it tends to the diminution of efficiency, is a gross misapplication of the term. As a nation, we cannot afford to have the efficiency of the newer universities reduced; on the contrary, the higher the efficiency, the greater the national result. Their income is already small enough, and ridiculously so in the way of annual subsidies from the Government, when placed in comparison with the grants provided from the public purses in Germany and the United States.

In order that the Committee on Public Retrenchment shall have the facts before them, and know exactly the strength of the claims to considerate treatment, the Vice-Chancellors of the four Northern Universities named have addressed a communication with this object to the Joint Secretaries of the Committee; and we cannot imagine anyone who will give studious thought to what is said in the communication doing other than concluding that the Committee would be performing a national disservice if, in their quest for lines of retrenchment, they recommended a reduction of the grants allowed to universities which are now accomplishing such grand work for the country. It is indeed work of the utmost economic value, seeing that its main purpose is the provision of men equipped with the means for helping in the advancement of industrial and commercial efficiency. Never before, as the Vice-Chancellors truly say, have we felt so much as at the present time the indispensability of such work; and it is vital to the future economic strength of the country. What the German Technical High Schools have done for German industry, the newer English universities have done, and are doing, for British trade. We must admit that the claims of these universities are indisputable. Their sources of income are grants from the Government and local authorities and the fees of students. If, unfortunately, the Government lowered their grants, the local authorities would be almost sure to follow suit. Besides now and after the war, the universities, through the certain falling-off of fees, will be in "reduced circumstances;" and yet, it is very generally acknowledged, this is more especially a period when there is room in this country for the promotion of higher industrial efficiency through the employment of men trained in the science as well as the practice of those things which are the sources of the wealth and sustenance of the nation. The Vice-Chancellors are justified in asking the Committee on Public Retrenchment to consider carefuly their submissions, and to defend the Universities against any suggestion which would work ill upon, instead of advantage, the country.

Gas Supply in Melbourne.

An increase of 8½ per cent. in the sales of gas for the first half of the present year, as compared with the corresponding period of 1914, forms the best possible indication of the satisfactory condition of the business of the Melbourne Metropolitan Gas Company, whose half-yearly meeting is reported in the news columns of this issue. How rapid the progress made has been is further shown by a remark of the Chairman, that the output of gas for the past six months equalled approximately the total output for the year 1907. The number of consumers is, of course, increasing; but it is evident much of the larger demand arises from the additional purposes for which gas is being consumed, owing to the policy pursued by the Company in the direction of pushing the installation of gas heating and cooking apparatus. The value, too, of the satisfied consumer is shown by the statement at the meeting that a large proportion of the business in fires has been derived from consumers who, previously having experience with one fire, had decided to extend the use of these labour-saving appliances in their homes. Much is also being done in the way of extending the consumption of gas for industrial purposes; while the work of the Company in connection with high-pressure gas lighting has on previous occasions been brought to the notice of readers. Altogether, the record of work placed before the proprietors was an excellent one. There is another matter upon which those connected with the undertaking deserve congratulation—namely, the number of employees on active service. It is a fact to be proud of that nearly 200 of the employees of the Company should have offered themselves for service in defence of their country.

Preparing the Way.

The Sulphate of Ammonia Association were indicating just recently that, at all events in one country of which they knew, the German makers had agents busy preparing the way for, directly peace was declared, recapturing trade abroad. Confirmation of the Germans being active overseas to keep their foreign markets warm is given in an article in "Eastern Engineering," which is based on information supplied by a New York correspondent. Directly the war is over, the Germans will require to become possessed of a large quantity of raw material which they have to import, but, through certain obstacles, cannot just now. The correspondent in question names 200 millions sterling as the sum that will have to be promptly spent in this way. But the money will have to be forthcoming. Germany is therefore putting itself into a position to establish a sort of *contra* account with the countries from which it will want to draw raw materials. This being so, the informant asserts, it is, during the war, maintaining as far as possible the manufacture of iron and steel, and storing up the products. The production of potash is also being continued on the large scale; and the dye factories are running at full speed. Directly the war is over, these and other accumulations of productions will be placed in the most receptive markets, and cash payments be demanded, so that stocks of the requisite raw materials may be purchased. Gold will be wanted; for the reputation that Germany's want of good faith with other countries, and its diabolical and murderous acts on defenceless people, has established is such that nobody will have any credit to spare for it. The American markets, it is said, are swarming with German agents. Users of steel are being asked for lists and specifications of the sheets and tubes they employ; and wily agents who are paving the way for a prompt resumption of trading by Germany in the world's markets are telling American users that the moment the war is over, they will be in a position to offer the materials at a price that has never yet been dreamed of. German dye makers, it is stated, are making similar offers, and are also conducting a most skilful campaign with the view of preventing developments of the American dye industries. They have been trying to coerce the Swiss makers into not doing business with this country in its emergency. This shows the length to which the Germans will be prepared to go in order to regain their overseas trade, and resume their fostering trade campaign. It is, after all, only their old methods carried farther—even to the stage of sacrifice (if need be) in order to secure a footing once more. Our home manufacturers must be very alert—now.

Systematizing National Re-organization.

In our national affairs, the bad habit has had long duration, and has grown, of "muddling through" things somehow, until at last something happens—as it has done in this war—which brings it home that the policy is not a good and beneficial one. Even in the attempts that have been made to organize national service during the war, the War Department has been enlisting all who were willing to join the Colours; the Munitions Department has been pulling another way to get all who can help in the work of making munitions; alarm has been felt as to whether sufficient skilled men are being left at home to meet the needs of essential public services; Mr. Asquith has pointed out that the financial needs of the country require an enlargement of exports and a reduction of imports, but labour for production has been curtailed by national requirements in other directions. So things have been muddling along without system; and the different needs have been jostling and competing with each other for men. Now there is the National Registration Act; and it was clear that this would not avail the country much unless method were applied to the information it placed at disposal. This has been seen; and the Government have therefore appointed a Committee, with the Marquis of Lansdowne as Chairman, with the object of dealing with the whole question from a national standpoint, instead of piecemeal. One of the problems with which the Committee will deal, it is suggested, will be to determine which trades shall henceforth be excluded from recruiting. The gas industry can now show a good case for exclusion—having supplied for active service the maximum number of men who can be spared, having regard to the nature of its public duties, and the work on which it is engaged in connection with the supply of requirements for the war. At the same time, a no small part is being done in devoting the machine-shops of gas undertakings to the production of munitions into which much energy is being put by the mechanics attached to the works. There is no doubt that in connection with their organization procedure, the Marquis of Lansdowne's Committee will hear from the gas industry.

The Yorkshire Octopus.

The gas companies and municipal authorities owning both gas and electricity undertakings in the area of the Yorkshire Electric Power Company will do well to keep an eye on the strategic movements of the concern. The Bill which the Company promoted last year, and in which they had the colossal impudence to ask for preferential and unprecedented lighting powers in numerous electrically unoccupied areas—powers which would have exempted them from much that generally governs electricity supply—it will be remembered was rejected by Parliament; and the Company were given to understand that, if they desired lighting powers in the areas named, they must promote a Provisional Order in respect of each, and conform to the ordinary terms. The organs of electrical intelligence intimate that the Company are now busy approaching the local authorities in a number of small districts, with the view of applying for Orders. Among others, the Thurlstone District Council have been interviewed by Mr. W. B. Woodhouse, the Engineer and Manager of the Company, in order to see whether his eloquence could secure their sympathy and support for a local Provisional Order in favour of the Company. He told the members that the supply would be on a sliding-scale—from 1½d. per unit for street lighting to 5d. per unit for house lighting, and that cottages would be supplied with four lamps (power not stated in our source of information) at 1d. each per week. The Company are evidently prepared to offer terms with a superficially seductive appearance. There is going to be a conference of the authorities grouped round about Thurlstone in the area upon which the Company have set longing eyes.

Sugar-Beet Growing Experiments.

Sulphate of ammonia makers would, of course, like to see sugar-beet growing established in this country on the large scale; for they can do with the maximum home demand for this secondary product of the carbonization of coal. But little has been heard lately of the cultivation of sugar beet in this country; and one had almost become afraid that the efforts of some four years ago had proved abortive. The fact, however, is that (we learn from a report in "The Times"), though the area devoted to the growth of sugar beet has not increased rapidly, many of the growers who supported the movement at the start have persisted with the experiment, and show no desire to give it up. The season has not been very favourable for ordinary root crops; but it is satisfactory to know that sugar beet has well withstood the weather. One grower—Mr. John Cossey, of Raveningham, Norwich—asserts that the beet raised in South Norfolk and the adjoining part of Suffolk is the best that the district has produced. The enterprise of Mr. Cossey in this direction has been profitable for several years; and he is satisfied there is a great future for the industry in England. But progress will be slow if the Government do not lend a hand. Though his land is poor, Mr. J. Thistleton Smith, of Walsingham, Norfolk, states that he has had an average crop of 10 tons per acre; and he is quite satisfied with the crops that have followed sugar beet on the same land. This is all satisfactory; but it would be more so if there were greater emulation of the enthusiasm and work of the pioneers.

Another Fertilizer.

Another fertilizer is promised; but the time for sulphate of ammonia makers being alarmed by it is not yet. It was in the Botany Section of the British Association that Professor W. B. Bottomley, of the University of London, made the announcement of the new discovery, which is the result of six years of research. It is simply the treatment of peat with bacteria; and the result is a manure which is credited with being fifty times more valuable than two-year old farmyard manure. It is probable that the new comer is only intended to be an accessory to engender a higher state of efficiency; for Professor Bottomley pointed out that, for complete animal nutrition, in addition to proteids, carbohydrates, fats and salts, there must be the presence of an accessory food substance, and that, for the complete nourishment of plants, there must be organic matter, known as humus, in the soil, besides nitrates, phosphates, and potashes. The substance in humus which really promotes growth has been named auximones. Some remarkable growing results from experiments were given. These are stated to have proved so attractive that the Board of Agriculture have made a grant for further research. From the commercial point of view, it is announced that the bacterized peat can be produced for a few pounds per ton; and that in all probability it will be placed on the market within the next few months.

Coal for Holland.

In the first editorial in the "Journal" for Aug. 24, a strange story was told, on the authority of the "Iron and Coal Trades Review," regarding the control by the Dutch Kolenbureau of coal imported by Holland, and of the control of the Kolenbureau by Germans. The story, it appears, only requires modifying in one particular; and this is that, while there had not been actual seizure of the coal taken into the country by those importers who desire to be free from the Kolenbureau, the threat that this would be done had been held over their heads. A protesting meeting of the free importers has been held; but, as a result, no hope was given them that they would be freed from German control. Of course, as the "Review" points out, it is a grave disadvantage to the merchants who do business with Great Britain that the German element in the Kolenbureau should become acquainted with their customers and the details of their business. The British Government have their eyes upon this question; and, according to the Amsterdam "Telegraaf," the President of the Board of Trade has expressed the view that, if the Dutch Kolenbureau intend to create a monopoly in regard to imported coal, it will be difficult for England to grant licences for the export of coal to Holland. It is the view of Mr. Runciman that the Netherlands Oversea Trust should make itself responsible for the import of British coal into Holland; and, as a matter of fact, applications for licences to export to Holland must now be accompanied by a certificate from the Trust.

OBITUARY.

THOMAS BOWER.

It is with the sincerest sorrow that we learn, from his first pupil subsequent assistant, and finally successor in chief official capacity in the West Hartlepool Gas and Water Company (Mr. Arnold Wiseman Branson) of the death of Mr. Thomas Bower, last Friday, at Llandrindod Wells, as the result of a stroke on the previous Monday night, from which he did not regain consciousness. Mr., Mrs., and Miss Bower had been staying at the Welsh health resort for some three or four weeks; and Mr. Bower was feeling much better and stronger for the change. On hearing the intelligence, Mr. Branson went at once to Llandrindod Wells; and thus enabled Mrs. and Miss Bower to make, with Mr. and Mrs. Akroyd Bower, their sorrowful return journey to Middleton St. George on Saturday, while he yesterday accompanied the body of his old chief back to the now darkened home. The funeral will be at West Hartlepool to-morrow (Wednesday). Much esteemed throughout the gas industry, a pillar of the gas profession in the North of England, the generous friend of many, from all parts of the professional ranks, and from those who have worked in any way with our friend in any capacity, will pass the deepest sympathy with Mrs. and Miss Bower, and other relatives. No man could have been more devoted as husband and father, no man evince friendship with more genuine sincerity, and no man could have secured greater confidence or loyalty from all who worked with him or under his direction. In his professional and commercial work, a quick practical perception characterized all he did; and in other respects he was precisely what he looked. Complete and direct frankness, conscientiousness, and broadness of mind were conspicuous among the qualities that so generally endeared him to all who came in contact with him.

It was only in June, 1914, we announced the then approaching retirement of Mr. Bower from the position of Engineer and Manager of the Hartlepool Gas and Water Company; and it was at the time mentioned that the long-existing official ties would not then have been severed, had it not been for the state of health of our long-time friend. On his own initiative relief from duties was brought about, as he felt that, owing to the fact that health compelled each year a number of weeks being given up to special treatment, he could not during those weeks be devoting himself as conscientiously as he had hitherto done to the Company's interests. The Directors of the Company, with the deepest regret, accepted the proposal; but only to the extent of the cessation of active official service, for they asked Mr. Bower to continue with them as consultant, and to attend Board meetings, and assist them with such advice as he could give them. With that implicit reliance, too, on his good judgment which had been established and hardened with service, the Directors asked him to take in hand the appointment of another man as Engineer and General Manager. There was one who was eminently fitted to succeed Mr. Bower, in view of his training and knowledge of the Company's business—that was Mr. Branson, who was at the time the Engineer and Manager of the Rhymney and Aber Valleys Gas and Water Company, though formerly, as already stated, he was Mr. Bower's first pupil, and subsequent assistant for six years.

It is now about thirty-one years since Mr. Bower went to Hartlepool. Eight years prior to that he was at Lytham; and his engineering training was obtained at Low Moor—one of the great seats of the iron industry—his family predecessors having been connected with the famous Low Moor undertaking for more than one hundred years. In fact, Mr. Bower was the first of the family tree, during upwards of a century, to leave the district and the Low Moor works to occupy a sphere elsewhere. He had a strenuous time at Hartlepool. In one year, there was as much as 26 per cent. increase in the gas consumption with which to deal. When he joined the Company, the output of gas was only 130 million cubic feet; the year before retirement, it was about 500 millions, despite fierce competition by electricity under the management of the Corporation. Notwithstanding low-priced electricity, the Company have been able to hold their ground; and this is an illustration of how largely it is necessary for the chief executive official of a gas undertaking to be commercially brilliant as well as so in construction and manufacture. During the long tenure of office by Mr. Bower, he practically rebuilt the Company's works, and prepared designs for an entire new 6 million per day plant on 15 acres of ground. The completion of this scheme, however, was largely held in abeyance, except that the first section of the purifying plant (1½ millions) was put down, a ¾ million a day carburetted water-gas plant erected, as well as a 1½ million holder. The price of gas was also largely decreased during Mr Bower's official *régime*, The water part of the business likewise increased considerably—in fact, at a rate greater even than that of the gas supply.

Outside the Company, Mr. Bower rendered help to surrounding gas and water concerns, both in the matter of the designing and construction of works, as well as in parliamentary matters. The whole of the time he was at Hartlepool, he was closely connected with the North of England Gas Managers' Association, and passed through the Presidential Chair. By the younger members of the profession in the Northern district, he was looked upon affectionately, and as almost a sort of professional "father."

The end has come—far too soon. Our friend will be greatly missed; and sorrow will be both keen and universal in the gas profession.

DEATH OF M. DE BROUWER.

Memories are vivified as we read in "Het Gas" the announcement that "the Council of the Dutch Association of Gas Engineers have received news from the de Brouwer family that the death occurred on July 27 last, at Bruges, of M. Jos. J. M. de Brouwer. The deceased, who was an honorary member of the Dutch Association, had attained the age of 72."

It was in the "Journal" for March 24, 1903, that the retort-charging machinery of which M. de Brouwer was the inventor was introduced to the gas industry—British and foreign; and prior to that the name of the inventor had been a name only to gas engineers in connection with the simple and light coke-conveyor, with its easily renewable parts, which he had designed a few years before, and which, like the charging machinery and subsequent improvements, were developed in certain technical detail and commercially by Messrs. W. J. Jenkins and Co., of Retford. From the time that we published the description of the new charging machinery, and gave an account of much else that was seen on a visit to M. de Brouwer, and which testified to his ingenuity on many sides, his name quickly became world-famous among gas engineers. Everyone recognized that from the quiet, grey-with-age City of Bruges, an engineering achievement had come which was destined to do much to revolutionize retort-house practices and construction. Charging through retorts from one side only of a bench meant that the next step must be discharging from one side. Charging into one side and discharging from the other meant machinery only on one side for dealing with the charges, coal-hoppers only on one side for feeding the chargers, and conveyors only on one side for removing the coke. It meant, in short, practically halving a large part of the equipment of horizontal retort-houses. It promised, too, a lessening of the number of retort-house operatives. Here was a great economic advance at one step; and the man who had made it was modest and unassuming, yet in his little works at Bruges enthusiastic and an engineer to the backbone. What he had done meant revolutionizing progress; and many engineers have had cause to bless his name. Economy in construction, economy in working, had their influence on the capital account and the expenditure side of the revenue account. But there was yet another thing our friend effected, and others have also had their part; and it was that, by enabling heavy charges to be put into horizontal retorts, he raised these to the level of keen and robust rivals of vertical retorts.

M. de Brouwer was a gentleman in all respects, and, as a friend, had a depth of affection which was warm and continuous. Those who knew him mourn with his family, and extend to them heartfelt sympathy. We regret that the latter days of the well-spent life should have been darkened by the terrible sorrows which have come upon Bruges and its inhabitants. A man of deep religious convictions and naturally highly sensitive, upon M. de Brouwer the horrors of war must have made impression which told seriously upon his health. Nothing would have delighted him more than to have seen peace restored to those formerly calm and always beautiful old-world streets which he had trodden, respected highly as a citizen, through many years of his life.

News was received unofficially last Wednesday that Sergeant E. L. Cottrell had been killed in action in the Western fighting line. Sergeant Cottrell, who held a position in the Gas Department of the Leicester Corporation, was the second son of Mr. William Cottrell, the Secretary to Messrs. C. & W. Walker. He had been on active service for more than six months.

A name well known in the gas profession figured last week in the list of war casualties—that of Private N. Bryan Donkin, of the 8th Rifle Brigade, the youngest son of the late Mr. Edwin Bryan Donkin, formerly Managing Director of Bryan Donkin and Company, Limited, of Chesterfield, and a great-grandson of the founder of the business in which he had been trained. He was reported missing in France, and believed to be dead. All the men in his particular trench were attacked with flame-projectors by the Germans and died at their posts.

PERSONAL.

Mr. C. E. Crocker, the Manager of the Kalgoorlie Electric Light and Power Corporation, has been appointed Manager of the electric lighting and gas departments of the Perth (Western Australia) City Council.

An engagement is announced between Kathleen Frances Helps, the second daughter of Mr. James W. Helps, of Berisal, South Croydon, and Vivian Desmond Ryan, the younger son of Sir Gerald and Lady Ryan, of Hintlesham Hall, Ipswich.

Second-Lieutenant F. N. Howes, who has received a Commission in the Royal Engineers, was educated at Doncaster Grammar School, and was afterwards a pupil for four years at the gas-works under Mr. Robert Watson. At the end of this time, he became junior assistant there.

It has already been notified that Dr. W. B. Davidson [who has been appointed Chemical Engineer to British Dyes, Limited] has been succeeded, subject to confirmation, by Mr. E. B. Tomlinson as Engineer of the Nechells works of the Birmingham Corporation Gas Department. Mr. Tomlinson, who is 43 years of age, was articled to Messrs. C. & W. Walker, and he afterwards remained with them for two years, at the end of which time he went to Messrs. Robert Dempster and Sons as leading draughtsman. For five years from 1897 he was Chief Draughtsman to Mr. Charles Hunt at Birmingham; and subsequently he held at different times the positions of Acting Superintendent of the Adderley Street works, Works Engineer of the station, and Works Engineer at the Windsor Street works.

From among 67 applicants, the Directors of the Romford Gas and Coke Company, Limited, have in succession to Mr. W. D. Child appointed to the position of Engineer of the Company, Mr. John C. Wright, who has for the last little while been acting as Assistant-Manager to the Grays and Tilbury Gas Company. Mr. Wright was trained at the Bromley works of the Gas Light and Coke Company, under his father, who was Engineer there. Subsequently, he spent some twenty years in the service of the West Ham Gas Company, of which he was Acting Engineer at the time of the amalgamation with the Gas Light and Coke Company. It was mentioned in this column last week that the Directors at Romford had appointed Mr. C. W. Boyns Manager (in addition to Secretary) of the Company.

The September number of "Het Gas" contains a biographical notice of Heer N. W. van Doesburgh, the Manager of the Leyden gas undertaking, who was elected an honorary member of the Dutch Association of Gas Engineers at the annual meeting held last July—*ante*, p. 189. From the notice, we gather that in 1881 Heer van Doesburgh took up a position as Engineer of Public Works in the Dutch Indies, but returned home in 1886, and was then for a short time at a spirit works at Delft. He then took charge of the Maessluis Gas-Works; and in April, 1888, he transferred to the Dordrecht Gas-Works, and in 1890 to Assen. In 1891, he became Assistant Manager of The Hague Gas-Works, where he remained until May, 1898, when he was appointed Manager of the Leyden works. Heer van Doesburgh became a member of the Dutch Association of Gas Engineers in 1888; and in 1899 he was appointed Secretary to the Association, which office he held for fifteen years. In 1907, he was Editor of "Het Gas." He has also acted as Secretary of the Coal Commission of the Dutch Association. Last year, however, under doctor's advice, he relinquished most work which was not of a strictly official character, but continued that of the Association until it could be taken over by the Central Bureau. Heer J. H. Janson is now Editor of "Het Gas," and Manager of the Central Bureau of the Association of Dutch Gas Engineers.

GAS ACTS FOR 1915.

[Third Article.]

In addition to local authority measures in which gas affairs had part, there were certain Electricity Supply Bills and Scotch Provisional Orders which were reviewed early in the year—the former in the "Journal" for Jan. 12, and the latter in that for Jan. 19. The Electricity Bills were those promoted by the London County Council and jointly by a number of the London Electricity Supply Companies—the two being competing schemes—and by the Yorkshire Electric Power Company. In view of the vastness of the proposals contemplated by the Bills referring to the Metropolitan and much adjacent area, and the extent of the opposition raised, the Government declined to enter upon the consideration of the schemes this session—their desire being to devote it solely to the war and to imperative national matters. We should imagine that the coming session will find the Government similarly disposed, and not desirous of having such measures revived. It is probable that the promoters, good sense prevailing, will not attempt to push the measures forward again until the war is at an end. As to the Yorkshire Company's Bill, it contemplated powers that were not in accordance with the general legislation affecting electricity supply for lighting and other purposes, and Parliament rejected it.

Regarding the Scotch Provisional Gas Orders, there are only three Confirmation Acts to notice, owing to the dropping of the Cowdenbeath and District Gas Company's Order, and to the fact that the measure promoted by the Lanarkshire County Council has not yet received the Royal Assent. This leaves the Forfar, Glasgow, and Port Glasgow measures as the only ones to be reviewed for the purpose of ascertaining the differences that may have arisen since Jan. 19.

The Forfar Corporation asked for additional borrowing powers up to £20,000; but the sanction is for £12,000 with power to apply to the Secretary for Scotland for such further sums as may be requisite. The provisions relating to the authority to demand prepayment for a period of three months or shorter period, and to the power to purchase waggons and trucks for the purpose of conveying gas-works materials, are missing; but the other points noticed when surveying the Bill, together with a number of modern general clauses, are in the Order. [*Parliamentary Agents: Messrs. Wm. Robertson and Co.*]

In the Glasgow Corporation Act, confirming their Provisional Order, the power has been conferred to construct a bridge over Adelphi Street, commencing within the Dalmarnock Gas-Works on the south side of the street, and terminating in the works on the north side of the street, together with all necessary buildings, works, machinery, and apparatus connected therewith, or incidental thereto. The new works are to be deemed part of the gas undertaking, and are to be completed within five years. [*Parliamentary Agents: Messrs. Martin and Co.*]

The Port Glasgow Gas and Burgh Extension Order Confirmation Act confers the lands and works clauses sought; but in connection with the power to maintain gas-works, the model residuals provisions have been inserted, including the obnoxious restriction as to the purchase rights not exceeding one-third the quantity of the home production. Power is given to purchase the Langbank Gas Company's works. Succeeding is a clause allowing the Corporation to contract for the supply of gas in bulk. The next one stipulates that "nothing in this Order shall authorize the Council to supply gas in the Burgh of Greenock." The proposed calorific standard has been altered from 550 B.Th.U. (total heat test) to 540 B.Th.U., in accordance with the model and accompanying conditions. The prepayment meter clauses have been adjusted to standard form; but the clause has been expunged which proposed to impose upon the prepayment meter users liability for both meter and money therein. The old clause, common to Scotland but not to England, as to preventing wilful waste of gas has also been removed. In the Order, the Corporation asked for borrowing powers to the amount of £70,000. This has been reduced to £55,000, exclusive of the purchase of the undertaking of the Langbank Gas Company. There are no other variations that are worth mention. [*Parliamentary Agents: Messrs. Beveridge, Greig, and Co.*]

ELECTRICITY SUPPLY MEMORANDA.

Electric Light and Eyesight.

In the report of the Departmental Committee on Lighting in Factories and Workshops, this statement appears: "We have had many general expressions of opinion that insufficient light and excess of light, especially when accompanied by glaring sources of light in the field of vision, are responsible for injury to the eye. While it is doubtless true that such unsatisfactory conditions lead to mental and physical strain, we have not received any concrete evidence of cases of actual disease of the eye." For the information of the Committee, Mr. F. Richardson Cross, F.R.C.S., representing the Royal College of Surgeons, the Royal Society of Medicine, and the Ophthalmological Society of the United Kingdom, made numerous inquiries among the ophthalmic surgeons on this aspect of the question; and an epitome of the results is given in Appendix XII. to the report. Reading the replies, it is interesting and satisfactory to find that, although gas lighting has such extensive use in factories and workrooms, there is not a single instance recorded of complaint having been made to the ophthalmologists of this system of lighting. Several of the replies, however, mention complaints by people working under the electric light; but the ophthalmic surgeons do not appear to have made inquiry as to how this is. Dr. W. Ernest Thomson, of Glasgow, acknowledges he has had "*many* complaints of electric light as cause of eye trouble; but, in the end, refraction error is often found to be the whole cause of the trouble." Now Dr. Thomson should piece together his own conclusion with that of Dr. A. S. Cobbledick, of London, who admits that he "sees *many* clerks who work all day by electric light, and who complain particularly of metallic filament lamps." He is of opinion that "this light brings out refractive error very quickly. Correcting glasses only partly relieve them of discomfort." Dr. W. B. Inglis Pollock, of Glasgow, states that he "has cases of postal sorters who complain of the lights in the sorting hall. He has found congestion of the optic nerve due to light shining directly on the man's eyes." Dr. J. Walton Browne, of Belfast, has had brought to his notice "some cases of conjunctival trouble caused by unprotected electric lights." Then Mr. M. Stephen Mayou, F.R.C.S., deprecates "light sources which are rich in ultra-violet rays, and is in favour of indirect lighting." Mr. J. Arthur Wood, M.B., of Hereford, is of opinion that bright sources of light are serious factors in the question." He also quotes from Behr in the "Archives of Ophthalmology, 1913," demonstrating chronic injury of the eye by artificial light in four cases, showing itself in impairment of the adaptation to dark without objective trouble. There is always considerable disturbance of the adaptation to dark in aphakic eyes; and he attributes it to the intense action of the ultra-violet rays.

A Preference and a Poor Foundation.

This testimony shows the quarter from which proceeds the cause of complaint and injury. It is not merely a question of giving a "dog a bad name." Since people have been working under electric lights, complaints have increased, and so has the work of ophthalmic surgeons. Most of those who replied to Mr. Richardson Cross's inquiries, urge that electric lights should be shaded. Of those who spoke of the complaints as to the noxious effects on the eyesight of electric light, only two express an opinion as to which kind of artificial light they prefer—Dr. W. B. Inglis Pollock, and Mr. J. Walton Browne. But they qualify selection by requiring strong barricades to resist the eye-injuring properties of the electric light. Dr. Inglis Pollock wants the light reflected from the ceiling. Dr. Walton Browne only prefers electric light "if well covered by a shade." "If," he remarks, "the lights are not covered by a shade, which seems impossible in some places of business, it is difficult to avoid shadow and glare." Then Dr. Clements Hailes, of Bristol, says he prefers "electric lamps, with diffusing bowls below;" but we see elsewhere that Dr. Hailes has "no information of diseases or affections arising from faulty lighting in factories." Mr. C. G. Russ Wood, F.R.C.S., of Shrewsbury, who apparently did not make a report upon eye effects, points out that metallic filament electric lamps cause more glare than carbon filaments." He "prefers holophane covers for avoiding this trouble." Dr. T. Harrison Butler, of Coventry and Leamington, who "has seen no eye trouble which can be fairly ascribed to defective illumination of workshops," has a liking for "mercury vapour lamps in the roof, supplemented by movable incandescent lamps with top shades;" but "the mercury lamp must not be placed near the work, on account of ultra-violet rays, which would cause ophthalmia electrica." Mr. W. Beaumont, of Bath, "where sunlight is impossible, prefers electric light, at the zenith, sufficiently strong to give a good light on the work." But here again this gentleman, with the existing systems of lighting in the factories in the Bath district, has had no complaints of workers unduly suffering from eye trouble. Then Mr. J. Elliot Square, F.R.C.S., of Plymouth, who makes no report as to eye effects, favours electric light placed about 8 feet from the ground—the shade being of ground glass. Now it would be particularly interesting to ascertain from these gentlemen why, with some ophthalmic practitioners acknowledging a shoal of complaints through electric lighting, there should be a preference for that light, but a preference always accompanied by a recommendation that the eyes should be well protected from the light. Is the preference due to the composition of the electric light being better *in their view* than that of gas light? Is it because gas light requires a certain amount of oxygen for combustion purposes; and that these gentlemen have overlooked the fact that Dame Nature has a chemical factory of her own, and from it provides compensations for work that has to be done in using her gifts? If neither of these is the explanation, what is it? Have these gentlemen really studied the relative intrinsic brilliancies of different lights, and the compositions of the lights. Dr. F. W. Edridge-Green, F.R.C.S., of London, says the artificial illuminant which has the nearest composition to average daylight is the best. Which is that light? Investigators of the spectra of different lights award to gas light a nearer approach than electric light to the spectrum of sunlight.

Practical Considerations.

It seems to us that these few gentlemen have pronounced a preference without having thoroughly investigated whether the foundation for it is of a solid character. Time is constantly adding to the illustrations of the inconsistencies of idealists. Why is it that our ophthalmic friends recommend so consistently that the electric light requires so much shielding from the eyes? There is only one answer. Because of its harmful effects beyond those of other illuminants of less intrinsic brilliancy and different composition. Why is it there is such little complaint of incandescent gas light? Because of its comparatively low intrinsic brilliancy, and its composition more consistent with the light of the sun. The ophthalmic surgeons look at the matter entirely from the point of view of the eyes, and recommend shields, indirect lighting, and so forth. They do not regard the matter from the practical point of view of light in relation to both work and eyesight. They only take in one factor, and omit the important one of work. While they do this, and recommend for factory purposes indirect lighting and shaded lights, the National Physical Laboratory have carried out tests with workers to ascertain the quantity of light required by them, and find that the operatives, from the point of view of work, object to any form of indirect lighting, and prefer direct lighting; that with the former they require from 40 to 100 per cent. more light at the source than with the latter—particularly where the work is fine detail; and that when working upon different coloured material different degrees of illumination are required. The preference of certain of the ophthalmists is apparently ill-considered from the practical point of view. What do the tests at the National Physical Laboratory teach? That indirect lighting is not preferred by those who have to work under the light; that it is not an economical system for the employer, on account of the additional electrical energy required and the extra expense of equipment and maintenance; that the workers themselves prefer a direct light; and so *à fortiori* the light used should preferably be one of low intrinsic brilliancy and good composition. There is too much consideration given to-day to the ease of lighting and extinguishing, and not sufficient thought accorded to the quality of the light between the time of lighting-up and extinguishing. We commend the point to the deeper consideration of those ophthalmologists who have pronounced a preference, but whose opinions, the Committee themselves say in their report, afford but "little positive evidence."

Aged Men, Gaslight, and Eyesight.

We should like to call the attention, too, of the ophthalmic specialists to another fact found in Appendix XIII. of the report. But this may be prefaced by the remark that the bulk of operatives in factories use incandescent gas-lights in the living and best rooms of their homes; and the workers who consult the ophthalmists do not complain of the effects of the lights in the home, but of the electric lights (the report tells us there are "many" of these complainers) in the workroom and the office. In some weaving and lace factories in the country, antiquated lighting is still to be found. Gas managers have considerable trouble in getting the factory owners to bring their lighting up to date by the installation of modern incandescent burners; but where the factory owners are wise, they do so in the interests of economy and improved lighting. But what do we find as a result of the letter that was addressed to certain operative associations by the Joint Secretaries to the Departmental Committee (Messrs. D. R. Wilson and C. C. Paterson)? The Secretaries of the Weavers' Association and of the Association of Beamers, Twisters, Drawers, and Machine Workers were unable to state offhand specific cases of bad eyesight due to bad lighting, though one of them admitted that there had been general complaints of the difficulty of working on account of indifferent lighting. But an interesting letter was from Mr. C. Wardle, Secretary of the Amalgamated Society of Operative Lace Makers. He wrote:

> It would be a very difficult matter to give you a specific case of injury to eyesight caused by insufficient lighting, as, for instance, take the case of two men working the same machine, and under exactly the same conditions—one may require glasses at a very early age, where the other one may dispense with glasses up to quite an old age.
>
> *A large percentage of our superannuated members have quite good eyesight;* and it may be contended that in their days the artificial light would not be so good as at present. This may be so; but in those days, they would have at least two lights to machines which were but 2 or 3 yards wide—the very widest being 4 yards wide, while we are working machines to-day 5 or 6 yards wide, with but two lights. Then, again, the modern machine is speeded-up to nearly double the number of motions per minute to what obtained in the old days.

Now our ophthalmic friends may be recommended to ponder the words: "A large percentage of our superannuated members have quite good eyesight." These men worked in the days of old low-power, low intrinsic brilliancy gas-lights, and not in the days of metallic filament lamps which the ophthalmologists say should be shielded or used in indirect manner, while the workers assert that they prefer direct lights, in order the better to see and deal with the detail of their work. Then give the workers the lights from which there is the smallest danger when unshielded, and which, if shielding be deemed necessary, requires the least amount. From practical experience and testimony, even ophthalmologists may learn something.

No Revolutionary Increase in Efficiency.

In our columns recently, Mr. H. C. Widlake was discoursing on questions which have relation to electric-motor efficiency. The President of the American Institute of Electrical Engineers (Mr. Paul M. Lincoln) has, also lately, been addressing himself to tracing the progress of some of the developments and practices in electrical matters; and he comes to the conclusion that the rate of progress must in future be slower than in the past, and that, if there are to be revolutionary improvements in the future, these must come from a fundamental change in method rather than from the continued improvement of existing methods. Mr. Lincoln sees, for example, little room for increasing the efficiency of the electric-motor, because the available margin for this is very narrow. He says it is a safe statement that the average efficiency of the conversion of mechanical into electrical energy by generators, or electrical energy into mechanical by motors, including all sizes, under actual operation, will reach 90 per cent. But because the size of the average electrical generator is much greater than that of the average motor, and because the generator can be operated at higher average loads than the motor, the average efficiency of converting mechanical into electrical energy is higher than that of the reverse process; and therefore, while the average generator efficiency is well above 90 per cent., it is doubtful whether the average motor reaches so high a figure. From his premises, Mr. Lincoln deduces that no development of a revolutionary character can be looked for in this respect. The ability to convert mechanical energy into electrical and *vice versâ* has reached so high a value that, even if perfection itself could be obtained, only a matter of 10 per cent. could be added to what has already been accomplished.

TRADE UNION CONGRESS.

Record Attendance at Bristol.

Last year, on account of the war, the annual Trade Union Congress was abandoned; but when the time came round for another of these labour functions, it found the country still at war. It was, however, decided to go forward with the congress on this occasion; and the event duly took place last week, when Bristol enjoyed the pride of a record attendance of over 600 delegates, who assembled to deal with an *agenda* long enough and varied enough to satisfy the most exacting of Labour Leaders. At the very opening of the proceedings there was an air of strangeness; for the customary civic reception was dispensed with—surely, an unwise, as well as an unnecessary step to take, at a time when differences between Capital and Labour should be forgotten in the desire to do the best possible for the country. However this may be, there was no civic reception, for the reason, as explained by Mr. J. Widdicombe (the President of the Bristol Trades Council), that "they in Bristol had no sympathy with such an important industrial body being welcomed by a representative of the class which they were unceasingly fighting for the rights of their trade unions." But there is another sort of fighting to be done now; and in connection with the consideration of this aspect of affairs, as touching Labour—which, to do the congress justice, it may at once be admitted occupied most of the attention of the delegates throughout the week—the "representative of the class" referred to might have been able to afford some assistance. As it was, Mr. Widdicombe himself extended the welcome.

The meeting then settled down to the Presidential Address of Mr. J. A. Seddon, who pointed out that the present one was the forty-seventh gathering of its kind. After a few words hinting at a concerted effort to mobilize all their forces to meet more effectively the power of organized Capital—in the course of which he remarked that, however strong might be their convictions, "light on the subject is preferable to heat"—the President found himself in the midst of the all-absorbing subject of the war, and problems arising out of the war—including the employment of Belgian labour, the high cost of living, women's labour, and war profits. After a protest against "the locusts of trade, who have been permitted, by inflated prices on coal, food, freight, and war requirements, to gravely menace national unity, and create irritation highly dangerous to success in our great struggle," the President went on to say they had been told that war profits would be regulated, and this promise should be carried out.

Some routine business having been transacted, a suggestion was put forward to the effect that the Parliamentary Committee be instructed to prepare a manifesto, or "new workers' charter," which should embody the economic changes repeatedly suggested by the congress resolutions. But the idea proved to be unpopular, for there was only one delegate in its favour—the proposer. The next resolution, however, proved to the liking of those present; and it mildly called for such a reform of parliamentary procedure as would enable private members' measures to be carried from stage to stage and from session to session, until they are either placed on the Statute Book or rejected. Next the Government were called upon to place all works of construction and buildings, including demolition, repair, or reconstruction of such works or buildings, under Government inspection, so as to afford workers the same protection as is enjoyed by those engaged in mines and factories. Under prevailing conditions, there seems little practical use in the instruction to the Parliamentary Committee to promote legislation at an early date to secure that superannuation and other trade union and friendly society benefits, or any private help of a financial character, should not be taken into account in assessing an applicant's income for the purpose of old-age pensions; and the same remark applies to the "demand" that the Government shall institute a national scheme of pensions for widows and orphans at the earliest possible opportunity.

Interest on Tuesday morning mainly centred in the debate regarding conscription, to which method of raising an army the congress proved unanimously antagonistic. The resolution, thus carried without a dissentient, set forth that the delegates to the congress, representing nearly three million organized workers, recorded their hearty appreciation of the magnificent response made to the call for volunteers to fight against the tyranny of militarism, and emphatically protested against attempts that were being made "to foist on this country conscription, which always proves a burden to the worker, and will divide the nation at a time when absolute unanimity is essential." The opinion was added that "no reliable evidence has been produced to show that the voluntary system of enlistment is not adequate to meet all the Empire's requirements;" and the belief that "all the men necessary can, and will, be obtained through a voluntary system organized." Mr. Ben Tillett, in a rousing speech, said he wanted the congress to tell the Government very frankly that the whole of the trade union movement, and they believed the whole of the labour world, was at their back; and he further declared that, though he was opposed to conscription both on practical and theoretical grounds, if he believed it would help to end the war sooner he would vote for it straightaway. There were, he added, more than a million trade unionists at the front; and the Government had no right whatever to enforce conscription until they had consulted them. Mr. Havelock Wilson, on the other hand, said he did not know of any time when Labour had been more consulted than during the progress of the war. Mr. R. Smillie, on behalf of the miners, argued that it was want of organization among those at the head of affairs that was largely to blame for the present state of matters. After this debate, the proceedings seemed a little tame, till an announcement was made by the President of the receipt of a telegram from Mr. Lloyd George, in response to the remark in his address which had called for the fulfilment of the promise made to deal with war profits. The telegram pointed out that, under the Munitions Act, 714 firms have already been placed under control, to the extent of limiting the profits so that the benefit of any suspension of trade union regulations shall ensue to the State, and not to the employers. This being so, Mr. Lloyd George quite fairly urged the delegates to persuade their unions throughout the kingdom to carry out their part in the bargain by suspending during the period of the war all regulations and practices which have the effect of restricting the output of material "so urgently required for the protection of our gallant troops at the front, and for the achievement of victory for the nation."

Hours of work figured among the discussions on Wednesday. The Parliamentary Committee were first requested to use their influence with a view to securing the passing into law of the Railwaymen's Eight-Hours Bill; and later a resolution was declared in favour of a Bill to generally limit the day's work to this period. A suggestion seemingly originating from a desire to make things, in certain circumstances, as uncomfortable as possible for employers, and of which the congress approved, was to the effect that unions negotiating with employers on matters which might ultimately lead to a dispute, should give timely notice to other unions likely to be immediately affected, so that joint action might be secured, if thought desirable. Previous decisions as to the establishment of a 30s. minimum wage for all adult workers were re-affirmed; but remarks made showed the possibility of this figure soon being regarded as an insufficient minimum. One delegate [unfortunately unnamed] announced his discovery of the fact that the advances in wages were cancelled by the advances in prices. Where did he think previously that advances in wages would be likely to come from, if not from the consumers of the commodities concerned? The congress then further pledged itself to assist the Government as far as possible in prosecuting the war.

On the following day, Mr. Lloyd George responded to an invitation to attend and explain his telegram already referred to; and in a characteristic speech he succeeded in getting in some home truths, and concluded by making a powerful appeal to his hearers "not to let the sympathy of the country be against labour by holding back its might by regulations, fetters, and customs, when the poor old land is fighting for life." And this appeal he made after showing clearly that there was dire need for it—after proving that in many cases munition workers and others are not doing, and are not allowed to do, their best.

In the course of the business transacted on Friday—which was of a very miscellaneous character—the President referred to the weighty words of Mr. Lloyd George; and it is to be hoped that the delegates will use the powerful influence they possess to secure the carrying into effect of their own resolution "to assist the Government as far as possible in the successful prosecution of the war," by allowing the war workers to put their best efforts into the tasks on which they may be engaged. The President said the Parliamentary Committee, who had held a protracted meeting, were seriously concerned at the statements made by Mr. Lloyd George, when he charged certain trade unionists with a breach of their undertaking with the Government to withdraw restrictions on output. He said they had evidence that since the outbreak of war trade unionists had loyally endeavoured to assist the Government, and to carry out their pledges. The Committee would take immediate steps to investigate the charges, and would then issue a report.

The congress came to an end on Saturday, when a number of resolutions remaining on the *agenda* were disposed of—including one calling for more factory inspectors.

GERMAN HYGIENE APPLIED TO GAS.

A CRITICISM OF PROFESSOR M. VON GRUBER'S WORK.

By W. J. A. Butterfield, F.I.C., Assoc.Inst.C.E.

The lecture, on "Gas and Hygiene," which was delivered by Professor M. von Gruber, at Munich, in July last year, and of which a comprehensive summary has been published in the last two numbers of the "Journal" [*ante*, pp. 449, 510], may possibly be accepted as the conclusive verdict of science on the hygienic aspects of gas lighting by persons who have the general impression that scientific research, if done in Germany, is necessarily beyond criticism. The writer, having a fairly long and close acquaintance with German methods of investigation of scientific and technical problems, suffers under no illusion on this score. As Professor von Gruber's lecture presents a flagrant instance of incompetence and futility in an investigation of which the results and conclusions, if not now challenged, may be accepted in some quarters without question, he thinks it opportune to offer some criticism of Professor von Gruber's work.

Professor von Gruber's Qualifications.

It should be borne in mind that Professor von Gruber is the successor in the chair of hygiene at Munich University of so distinguished and trustworthy an authority on hygiene as Pettenkofer. Probably it was largely on this account that the German Association of Gas and Water Engineers applied to Professor von Gruber when it required an authoritative and exhaustive investigation and report on gas and hygiene. But it was an unfortunate choice. On general grounds, it may be said that, for an investigation of the practical bearing of the use of an industrial product in everyday life, it was unwise to apply to the occupant of a professorial chair. With the exception of most of the older generation of professors, as typified by Pettenkofer, and a few of the present generation such as Professor H. Bunte, who throughout their careers have been concerned with technical matters, the professor (in Germany, in particular) is, by reason of his associations, unlikely to bring sound judgment and good sense to bear on the elucidation and exposition of such problems. In addition to labouring under this general disability of his class, however, Professor von Gruber appears, from the evidence afforded by his lecture, to have been exceptionally ignorant of scientific research carried out elsewhere than in Germany bearing on the subject dealt with. Such ignorance—apparently due in the first instance to disparagement of researches made in other countries—has, indeed, been noticeable in a very large proportion of the German professoriate in recent years; and it indicates the curious and rapid growth among them of an insularity surpassing that with which men of other nations have in the past been more or less unjustly accused. Technical men in Germany display this insularity in a much less marked degree than their academical colleagues; and on this account the German Association would have been better advised to have sought out a technical consultant to undertake the research on gas and hygiene instead of Professor von Gruber. Unfortunately, however, the independent consultant is very rare in Germany owing to the national tendency, which has become more and more pronounced of late, to exploit the official subsidized by the State or Municipality at the expense of private initiative. One consequence of this tendency is that the professor, who is essentially a servant of the State, comes to believe that he is impeccable, and that his conclusions and pronouncements are infallible. Being backed by State authority, they are, indeed, generally so received in his own country. This apotheosis of the professor is demoralizing for him and bad for the public.

Professor von Gruber appears to have set about the investigation which the German Association of Gas and Water Engineers asked him to undertake, with preconceived opinions and prejudices which augured ill for an impartial study and report. Towards the end of his lecture, he confesses that, at the outset, no one at the Munich Hygienic Institute "doubted that gas lighting was inferior to electric lighting for living-rooms in respect of the air, since electric lighting does not contaminate the air, develops no moisture, and produces little heat. It was a question of the extent of the difference between the two." He accepts electric lighting, as used by him in the experimental room, as an ideal condition. If it really represents his ideal in respect of hygienic requirements, hygiene as understood at Munich University appears to be on a very low plane. The writer would be sorry to spend many evenings in the living-room lighted by electricity which Professor von Gruber took for his standard of ideal living-room conditions. In a room which approximates to a sealed chamber, electric lighting should obviously be less trying to the unfortunate occupants than gas lighting; but in respect of a room ventilated to meet the ordinary hygienic requirements of a living-room, Professor von Gruber has failed entirely to establish that his initial prejudice in favour of electric lighting has any justification.

Destruction of Micro-Organisms and Smells by Gas Lighting.

He refers, in the course of his lecture, to statements emanating chiefly from this country, that gas lighting purifies the air, destroys smells, and tends to disinfect the air of rooms; that its warmth considerably improves ventilation; and that as a consequence the air of an occupied room which is lighted by gas is better than that of one lighted by electricity. He does not give the authority for any of these statements, still less does he refer to the investigations on which they were presumably based. The statements, as quoted by him, are broader than the writer remembers reading in the writings of any English scientific or technical authority; but there are experimental data of a higher grade than Professor von Gruber's in support of rather more definite statements to similar effect. Professor von Gruber even supplies data supporting some of these statements in an unexpectedly conclusive manner; but in these cases he chooses in his conclusions to override the evidence of his own work. One striking instance of this will suffice.

Professor von Gruber proceeded to test the contention which he says came from England, that gas lighting disinfects living-rooms by destroying the organisms in the air. Experiments were carried out for him by a colleague. He gives the results, but considers that the differences which they show between the number of organisms in the air of the gas-lighted and the electrically lighted room is inconsiderable, and of no practical significance. The contention to which Professor von Gruber here refers may have been drawn from several English sources; but it was expressed in moderate and sufficiently precise language, in 1903 and again in 1910, in the text-book on "Acetylene" by the late Mr. F. H. Leeds and the writer, in the following words:—

> There is one respect in which acetylene and other flame illuminants are superior to electric lighting—viz., that they sterilize a larger volume of air. All the air which is needed to support combustion, as well as the excess of air which actually passes through the burner-tube and flame in incandescent burners, is obviously sterilized. But so also is the much larger volume of air which, by virtue of the up-current due to the heat of the flame, is brought into anything like close proximity with the light. The electric glow-lamp, and the most popular and economical modern enclosed electric arc-lamp, sterilize only the much smaller volume of air which is brought into direct contact with their glass bulbs. Moreover, when any large numbers of persons are congregated in insufficiently ventilated buildings—and many public rooms are insufficiently ventilated—the air becomes nauseous to inspire, and positively detrimental to the health of delicate people, by reason of the human effluvia which arise from soiled raiment and uncleansed or unhealthy bodies, long before the proportion of carbonic acid by itself is high enough to be objectionable. Thus a certain proportion of carbonic acid coming from human lungs and skin is more harmful than the same proportion of carbonic acid derived from the combustion of gas or oil. Hence acetylene and flame illuminants generally have the valuable hygienic advantages over electric lighting, not only of killing a far larger number of the micro-organisms that may be present in the air, but, by virtue of their naked flames, of burning-up and destroying a considerable quantity of the aforesaid odoriferous matter—thus relieving the nose and materially assisting in the prevention of that lassitude and anæmia which occasionally follow the constant inspiration of air rendered foul by human exhalations.

There is evidence from English sources justifying these contentions; but the experiments made by one of Professor von Gruber's colleagues substantiate the principal contention in a conclusive fashion. He introduced organisms into the air of each of the rooms, and at definite intervals took measured samples of air and determined the number of organisms therein. The average results of the series of his tests show that the percentage proportions of the original number of organisms left in the air of each room after the lapse of the following times from the commencement of the test were as follows: At one hour, gas-lighted room 60, electrically lighted room 77; at two hours, gas-lighted room 38, electrically lighted room 58; at three hours, gas-lighted room 22, electrically lighted room 42; at four hours, gas-lighted room 14, electrically lighted room 32; at five hours, gas-lighted room 9, electrically lighted room 23; at six hours, gas-lighted room 5, electrically lighted room 17. If figures obtained by Professor von Gruber and his co-workers are of any value at all, those quoted clearly demonstrate that gas lighting has a very destructive action on micro-organisms in the air of the room. It is indeed surprising that, in face of them, he gives vent to his prejudice, and commits himself to the statement that he considers the difference inconsiderable, and of no practical importance. This inference, drawn in spite of his own experimental data to the contrary, stamps his judgment and all his deductions as entirely worthless.

Not less purposeless, though more ludicrous, are Professor von Gruber's efforts to demonstrate that gas lighting has no destructive action on the odoriferous matter in air rendered foul by human or other animal exhalations. His method of testing the validity of the contention that gas lighting has a greater effect in this direction than electric lighting consisted chiefly of observations of the persistency and pungency of cigar smoke in the two rooms, one lighted by gas, the other by electricity. Cigar smoke —itself the product of carbonization and partial combustion— obviously would be little or not at all affected by contact with heated surfaces or momentary passage through flame. No one but a professor, and a German at that, would have resorted to cigar smoke as a reasonable experimental alternative to human or organic effluvia. The smell of *sauerkraut*, which was the only other sufficiently familiar and penetrating to appeal to Professor von Gruber, is scarcely less ludicrous than cigar smoke as a subject for testing the validity of the proposition advanced in the paragraph quoted from the text-book on "Acetylene." The smell of *sauerkraut* is due to fairly definite and stable compounds—such as acetic acid—and obviously would not be affected by contact with heated surfaces or flame to the same extent as the smells, directly derived from organisms, referred to in the quotation. Thus, as regards any reasonable claims which have been advanced in this country for superiority of gas over electric lighting in respect of the destruction of micro-organisms and effluvia in the air of a living-room, Professor von Gruber not only does not disprove the claims, but in so far as his experimental work bears on them at all, he substantiates them. Nevertheless, he advertises his prejudiced attitude by stating, in the face of his own proofs to the contrary, that he disbelieves these claims.

THE VENTILATING ACTION OF GAS LIGHTING.

Professor von Gruber's study of the effect of gas lighting on ventilation is very unsatisfactory, chiefly because he chose and prepared for his experiments rooms which were practically devoid of natural ventilation. Gas lighting had, therefore, no opportunity of increasing ventilation which was practically non-existent. The state of ventilation, or rather want of ventilation, normally in the rooms which he used for his tests will be readily appreciated from consideration of the figures given in Table IV. of the summary of his paper [*ante*, p. 510]. The room contained a little over 2000 cubic feet of air-space. In this room, without gas lighting, he kept five people for four hours. The air-space per head was therefore 400 cubic feet, which is 150 cubic feet per head more than the legal minimum for factories and workshops in this country. Nevertheless the carbonic acid resulting solely from breathing of these five people raised the proportion in the air to nearly 32 parts per 10,000. The generally accepted maximum for the proportion of carbonic acid in the air of factories and workshops is 12 parts per 10,000. It is obvious, therefore, that the normal ventilation of Professor von Gruber's experimental room, in the absence of gas lighting was so low as to be negligible. The room was, in fact, unfit for occupation as a living-room, judged by reasonable hygienic standards. It is not surprising, therefore, that when Professor von Gruber kept eight persons in this room for six hours—the cubic space per head being the factory allowance of 250 cubic feet—it required the use of only one gas-burner to raise the proportion of carbonic acid in the air to 65 parts per 10,000. When the number of people was increased to twelve, it is also not surprising that, in the absence of gas lighting, the air in this experimental room showed as much as 125 parts per 10,000 of carbonic acid—an atmospheric condition which would not be tolerated for a moment by the occupants of any factory, workshop, or living-room in this country. What good purpose could be served by proceeding to demonstrate the effect of gas lighting in a room in which the air was so stagnant as to become, from breathing alone, intolerable to the occupants?

A point in Professor von Gruber's work which needs clearing-up is how he determined the ventilation in the experimental rooms throughout the tests. He does not describe the method he adopted; and the results are, quite apart from any question of gas or other lighting, the reverse of what would be expected. The effect of an increase of temperature in a room in all ordinary circumstances is to increase the ventilation; but Table I. [*ante*, p. 451] and Table IV. [*ante*, p. 510] show that rise of temperature in the experimental rooms at Munich had the effect of decreasing ventilation. It would almost appear to one familiar with methods of ascertaining the ventilation of a room that Professor von Gruber had blundered either in his mode of determining the ventilation or in calculating the results, since they are quite contrary to general experience and probabilities.

Bearing in mind the unsuitableness in respect of ventilation of the experimental rooms, and the uncertainty as to the measurement of the rate of ventilation, it should really be very gratifying to adherents of gas lighting that the condition of the air in the gas-lighted room differed so little from that in the electrically lighted room that even Professor von Gruber states that the differences are not sufficiently great to come into consideration from the hygienic standpoint, and that they do not indicate that gas lighting is undesirable in living-rooms. This conclusion he believes can be accepted with entire confidence.

(*To be continued.*)

Eastern Counties Gas Managers' Association.—A circular letter, signed by the President (Mr. W. B. Farquhar) and the Hon. Secretary (Mr. Joseph Davies) of the Association states that at a meeting of the Committee it has been decided, after due deliberation, for reasons that will be patent to every member of the Association, to postpone until the spring of next year the general meeting usually held in the autumn. That the routine business of the Association may be carried on, a meeting of the members will be held at the Liverpool Street Hotel, Hertford Room, Bishopsgate Street, on Thursday, the 30th inst., at 3 o'clock in the afternoon. No address will be presented or papers read. The only business to be transacted will be the induction of the incoming President and officers, the reception and passing of applications for membership, and such other business as may be brought forward.

BENZOL RECOVERY FROM TOWN'S GAS SUPPLY

By W. R. HERRING, M.Inst.C.E.

THE question of increasing the available supply of benzol and kindred products arising from the carbonization of coal was never more insistent than at the present time; and, as I have had occasion to deal with this question not only from a gas engineer's but from other points of view as a commercial proposition, it may be of interest to record the conclusions arrived at.

Technical achievement does not always imply a commercial possibility. The history of tar products is so prolific in commercial changes that a problem which is unsound commercially at one period is quite a different matter at another. Perhaps at the present day, it is not correct to look upon it as a commercial proposition at all, but rather one of urgent national necessity. It is, therefore, the duty of all who can help to do what is possible to facilitate its recovery.

I recently had occasion to approach this subject from a different point of view, such as many others are engaged upon at the present moment, and that was the recovery of toluol without depreciating the luminous and calorific value of the gas. The suggestion put forward by Dr. Colman and others was that a benzolized oil used in the washer would enable the toluol to be extracted from the gas without materially affecting its luminous and calorific values; and, in order to put this theory to the test and so as to prepare the staff and educate them to the working of a large plant, I had certain experimental workings carried out on plant in Edinburgh that has afforded important and reliable information.

In organizing the course of research, it was desired to make the experiments correspond as nearly as possible to practical working conditions, and such as will prevail with the larger plant. The apparatus used was a small rotary washer, 4 ft. 6 in. long by 2 ft. 6 in. diameter, of the Holmes type; and the necessary tanks and receptacles for the wash-oil and effluents and connections were duly installed. The capacity of the washer was determined in relation to a 5 million unit of coal-gas plant; and the portion of wash-oil used, the rate of flow of gas through the washer, and the rate of flow of oil through the washer were all established on lines exactly parallel to the working of a much larger unit. The following conditions of working were observed :—

Straight coal gas was taken from the outlet of the meter.

The scrubbing oil used was a light grade coal tar oil, specific gravity ·9862, flash point 151° Fahr. close test.

The amount of gas passing the scrubber closely approximated 500 cubic feet per hour.

The rate of flow of oil entering the scrubber was to be 25 gallons per 10,000 cubic feet.

The operations were to be continuous.

The scrubber was filled with the wash-oil, and then the gas and oil were turned into washer in proper quantities; the oil (once it left the washer) passing off into separate receptacles for each day's run. Straight coal gas and the scrubbed coal gas were conserved in accurately proportioned quantities in two separate holders.

The first series of experiments was directed to show the effect of washing the straight coal gas with an unbenzolized oil; and, in order to determine this, a three days' run was occupied and the fullest details were kept by the analysis of the gases both chemical and otherwise.

To summarize the results. It was found that a 16·11-candle gas (No. 2 "Metropolitan" burner) was reduced to a 10·51-candle gas—showing a loss of 34·7 per cent. of luminous value. Its calorific value was originally 585·3 B.Th.U. gross; and it was reduced to 559·1 B.Th.U., or a loss of 4·5 per cent.

The next series of experiments was directed to establish the effect of benzolizing the wash-oil. The conditions of working were the same, and the wash-oil used was the same. To it, however, was added 5 per cent. of benzol—the benzol used having a specific gravity of ·880, boiling at 80° C., all distilled at 92° C. and containing no toluol.

To summarize these results, it was found as a result of nine individual days' working that a gas of an average power of 16·08 candles was reduced to 15·06 candles, or a loss of 6·34 per cent., and its calorific value of 579·4 B.Th.U. was reduced to 576 B.Th.U., or a loss of 0·58 per cent.

The results of these investigations seem to clearly establish the correctness of the suggestion that a benzolized oil containing something between 4 and 6 per cent. of benzol is an effective washing medium for the extraction of toluol without making any material change in either the candle power or the calorific value of the resulting gas. The point, however, that will strike gas engineers more than any other is the comparatively insignificant loss of calorific value when using an unbenzolized oil. It goes further to establish the fact that a very large percentage of the benzol constituent of the gas can be eliminated, and still leave a candle value sufficient to give some luminous effect when burnt as a naked flame.

If this can be established, and I have no doubt or hesitancy in saying that it can, and in view of the national necessities at the present moment and the certainty of there being a future market for benzol for motor-traction purposes, the question arises as to whether the time is not opportune to press for such an enactment as will free, once and for all, the entire country from:

(*a*) The incidence of the luminous flame test.

(*b*) Establish in its stead the calorific test at such a value as will not materially vary from the common value of to day's supply—viz., 500 B.Th.U. gross.

Bearing in mind the position taken up by a House of Lords Committee presided over by Lord Clinton, and their expressed view that the gas should retain some degree of luminosity when burnt as a naked flame, it will be necessary to show that the removal of the benzol constituent will not entirely eliminate luminous value. The figures already quoted, which can doubtless be supported from many quarters, should be sufficient to establish this point, and that the luminous value remaining can only be destroyed by over-exhaustion in the process of manufacture or by dilution with a non-luminous gas, such as water gas.

The gas industry is not strong enough to bring about such a vital change, excepting over many years, through Private Bill enactments; but there is little doubt that a common enactment, applicable to all, would be welcomed in a vast majority, if not all, towns. It will not materially alter the real value of the gas, but only its fictitious value when burnt by means which the public generally do not employ.

REFINEMENT IN GAS-FIRES.

The "Classic" Series of Fletcher, Russell, and Co., Limited.

Advances in the construction and efficiency of gas-fires could never have left us with such incongruities as the old repellent types which were an eyesore in most rooms, though accepted on account of their one virtue of utility. There is no reason at all why any gas-fire should be offensive through ugliness, because, as a rule, the ugliness means waste of metal. The makers of gas-fires, fortunately for the gas industry and themselves, have during latter years made huge departures in designs; and from crude styles, we have reached a refinement which in itself, while extending the scope of adoption, also adds to utility, by reducing the quantity of the heat-absorbing metal work, which promotes convected heat, and as a consequence detracts from radiant efficiency.

Messrs. Fletcher, Russell, and Co., Limited, in the new designs which they have brought out for the coming season for adoption in recessed fire-places, have made a distinct hit. As a matter of fact, what will be known as their "Classic" series of designs in fires for this particular purpose will be, we are certain, on the tale of the illustrations alone, voted as taking premier position among their best efforts in this line of productions. Here we have the artistic beauty given by lightness and clearly defined form, and yet with ornamental features which will enable the cleanliness, the heating utility, the constancy, the adaptability, the convenience, and all else associated with the modern gas-fire, to be incorporated in the most choice of fire-places, such as those of the "Jacobean" and "Adam" styles. This is what is wanted by the architect, whose services are being sought and utilized more and more in the execution of renovations and new decorative and furnishing schemes. He is the man whose interest is worth cultivating, and whose notions as to the fitness of things have to be satisfied. The architect cannot fail to appreciate that in these new designs he has not only something that will meet the economic and hygienic requirements of his clients, but that he can introduce the fires with the confidence that they will not offend the most fastidious tastes in refinement and congruity.

Take the first illustration. It is identified as the "Boscobel" No. 1. It has a crown and oakleaf pediment, and is a graceful production. So is the "Burleigh" No. 1, with its scroll pediment. "Burleigh" No. 2 is not included here; but it is equally good in the lines of its design, and has a fan-shaped pediment. The "Boscobel" No. 2, with Tudor rose pediment, is illustrated. All are attractive; and the difficulty will be for those who have to make choice of one or the other to say which has some superiority to turn in favour the balance of preference.

The fires are all fitted with patent non-lighting-back burners; and, needless to say, with Messrs. Fletcher, Russell, and Co. as the producers, the castings are fine, and so are the finishes—best art black, armour bright, and bronze. In the bronze finish, the fires look very handsome.

While the makers of gas-fires, who have already reached high standards in efficiency, construction, and outward styles, continue to so successfully seek for yet further improvement, and to meet changes in requirement, the gas industry can see before it an illimitable field for the expansion of their heating business. To enabling compliance with the industry's opportunities, Messrs. Fletcher, Russell, and Co. have made good contribution.

DAMAGE TO FRENCH GAS-WORKS BY THE WAR.

The opening article in the current number of the "Journal des Usines à Gaz" is on the subject of the effects of bombardment upon gas-works generally, and some French ones in particular. It appears that, before the present war, information in regard to the destruction caused by projectiles of all calibres to the various installations of plant constituting a gas-works was confined to observations, made in the course of the war of 1870, in Paris, Strasburg, Metz, and a few other places. The power of the material employed in that war cannot, however, be compared with that of the munitions now in use; and, moreover, account must be taken of the large number of projectiles thrown from aeroplanes.

The first gas-works struck during the present war were those at Mulhouse. In the bombardment which took place on the night of the 9th-10th of August, 1914, the two gasholders were badly damaged by shrapnel and balls. The side sheets were pierced and the gas escaped, but fortunately was not ignited; and as soon as firing ceased the holes were easily plugged. The other portions of the plant sustained but little damage, with the exception of the breakage in three places of the mains on the works. The necessary repairs were quickly effected, and the consequence was that the lighting was interrupted for hardly 24 hours in one part of the town, and for only 48 hours in another part.

Reference has already been made in the "Journal" to the damage done to the gas-works at Rheims [see Vol. CXXX., p. 458]. On the 15th of June last, 111 projectiles had been thrown into them; the portions of the plant chiefly injured being the exhauster and station-meter house, the purifier-house, the station governor, and the gasholders. There are five holders, and they received nine shells, some of large size. These generally burst when they came in contact with the sides of the holders, but in no case was the escaping gas ignited. In the case of one of the small holders—the first erected on the works—damage was done by the bursting of a shell at a distance of about 8 feet, and a considerable number of holes were made in the side. Portions of the shell went right through the holder, and came out on the opposite side as well as at the crown; but the gas escaped without ignition. Some minutes afterwards, however, another shell burst on the off side of the holder, and fired the gas, which burnt itself away. When the holder grounded the flames were extinguished without causing any explosion.

The "Gas Age" (New York) lately gave some particulars—(obtained probably from a German publication—of the effects of the shells thrown at the holder at the Münster Gas-Works, in Upper Alsace. As in the preceding case, the gas was not fired by the striking projectiles; but one made a hole 5 feet long and 8 inches wide, which allowed of the rapid escape of the gas. In the evening following the accident, when military operations had ceased, the staff on the works proceeded to repair the holder by covering the hole with a sheet-iron plate. This was done entirely by the light of small electric lamps, in order not to attract attention; and it was finished by daybreak.[*]

Particulars reached our French contemporary of the damage done to a gasholder in the region of Flanders—probably the one at Ypres. A considerable number of projectiles struck the crown and the above-ground metal tank (the latter being pierced with holes more than 6 feet in diameter); while the guide-framing was entirely broken.

These particulars show that in gas-works under bombardment it is the holders which have suffered most. This is quite understandable from the fact that they are extremely tempting targets

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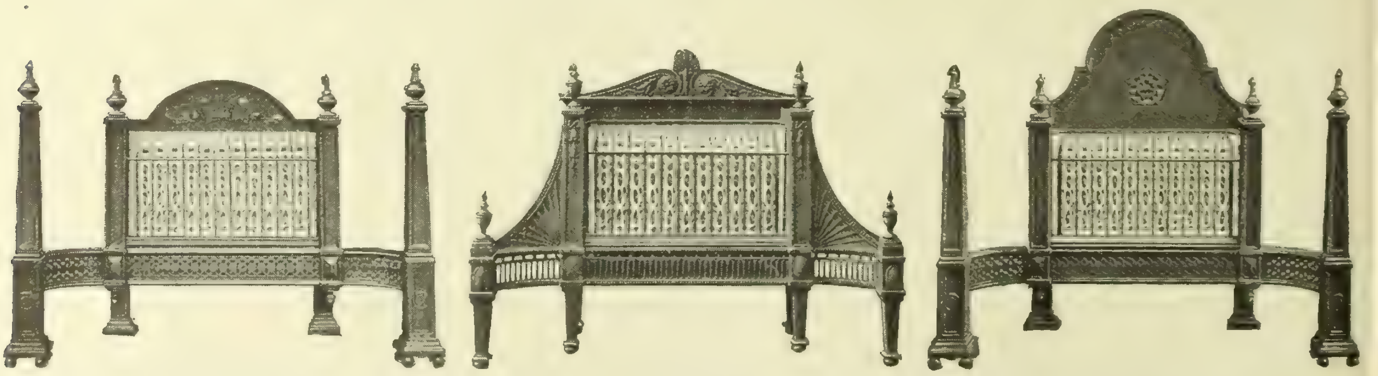
[*] See "Journal" for June 22 last, p. 697.



The "Boscobel" No. 1. The "Burleigh" No. 1. The "Boscobel" No. 2.

MESSRS. FLETCHER, RUSSELL, AND CO.'S CLASSIC SERIES OF GAS-FIRES.

for the enemy. Generally speaking, the pipes in the ground have not suffered when they have been laid at sufficient depths. When the projectiles have fallen on places covered with paving, explosion has had only a minimum destructive effect, as the shock produced on contact with the paving has made the shell burst before it has penetrated the soil, and the pieces are scattered above the ground without breaking the pipes. The particulars further justify the conclusion that projectiles which attack gasholders do not fire the escaping gas.

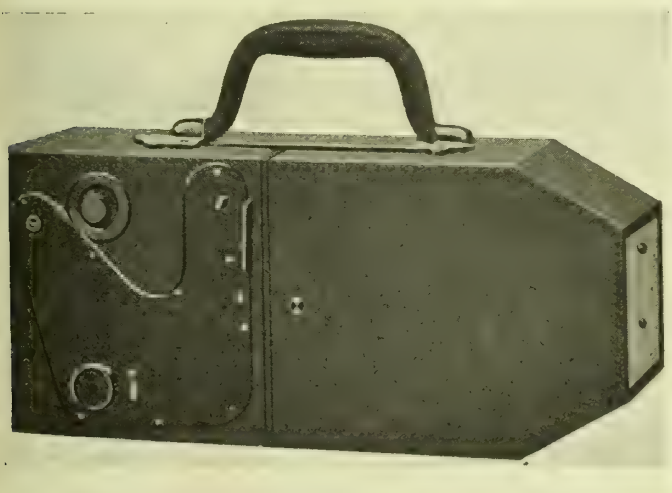
From what has been said, the conclusion may be drawn that certain precautions can be taken to protect the plant in a gas-works as far as possible from the effects of bombardment. They may be summarized as follows: For pipes or underground structures, it will suffice to cover them with a paved surface or with sheet-iron plates, planks, &c., which will throw off the projectile before it can bury itself in the soil. For gasholders, it is absolutely necessary, in order to prevent the entrance of air, to secure the free upward movement of the lifts. To do this, if, after the fall of different projectiles, flames of gas are produced which cannot be extinguished, steps must be taken to ensure the cooling of all the guide-framing, &c., attacked by these flames, so as to prevent it from losing its shape. So far as stopping-up the holes is concerned, there are a number of ways which are well known to gas managers. The distribution plant suffers to a greater extent than would be generally supposed from the effects of the fall of projectiles; and in all cases where the town mains have had to sustain bombardment there should be a careful examination of the whole of them. This will reveal the need for the repair of a great number of broken pipes, and especially of unsound joints. Evidence of this has been furnished recently in the case of distributing systems of not very great importance.

In the course of the article, reference is made to the damage done to the gas-works at Hartlepool and Scarborough, particulars of which have already appeared in the "Journal."

PHOTOGRAPHIC RECORDS OF METER-INDICES.

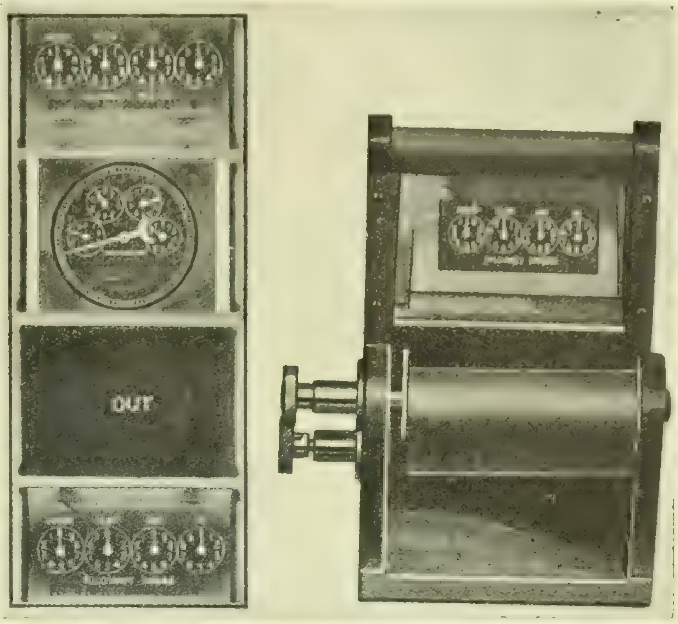
In last week's issue, p. 494, a paragraph appeared regarding the proposal of the New York Consolidated Gas Company to take photographic records of their meter indices, so as to retain permanent records, in place of leaving the readings entirely in the hands of the employees. The last number to hand of the "American Gaslight Journal" gives particulars of the apparatus employed and the operations involved—accompanied by two illustrations which are reproduced pending the receipt of fuller details of this interesting development.

According to our contemporary the special camera employed has been developed by the Folmer and Schwing division of the Eastman Kodak Company, of Rochester, N.Y., for the use of meter-readers, who can thus bring to the office at the close of the day's work photographic records of the dial-pointers on the meters of the customers visited. To "take" the reading, he simply holds the camera opening against the dial glass and presses a lever, which automatically opens the shutter for a definite period, and at the same time lights four small battery-operated lamps to illuminate the dial. After each exposure, the shutter is locked; and it cannot be operated again until the film-roll has been advanced for the next picture. The device can also be used as a flash-lamp in dark passage ways, by pressing down the lever part of the way, without operating the shutter.



Electric Lighted Camera for Recording Meter-Readings.

A roll of film is sufficient for 75 exposures, and costs 25 c. Two additional rolls can be carried inside the camera box—making a total of 225. The film consists of an emulsion on opaque paper, backed-up with a white coating that makes the image on the developed film show clearly, although reversed right and left, mirror fashion. The developed film is examined by mounting the rolls on a stand and reading the reflection in a mirror. As the customer's name and meter number are marked on each dial, the photograph leaves no doubt as to the identity of the reading. If the customer is "out" the meter-man notes this fact on a card, and photographs it for his record.



A Film and the Stand for Examining Meter-Index Records.

The "Factograf" camera, as it is called, provides a definite photographic record of the condition of the customer's meter, and avoids all possibility of misreading or future controversies. Such evidence, it is pointed out, is especially useful in the case of maximum-demand meters, where, ordinarily, the meter-reader notes the position of maximum-demand pointer, and then sets it back to zero—thus destroying all record of its position.

THE BRITISH ASSOCIATION MEETING IN MANCHESTER.

This year's meeting of the British Association, which concluded in Manchester on Saturday, has been somewhat remarkable in several respects. In the first place, while the attendance—as reflected in the reception room crowds just prior to the sectional meetings each morning—fell considerably short of the average, nevertheless the attendances at the meetings of those sections with which we are more directly concerned struck one as distinctly above the average. The reason no doubt is that chemistry and engineering are playing a very important part in the nation's affairs just now; and there was every prospect of some action being taken officially by the Association, through recommendations from the sections. This undoubtedly gave a fillip to some of the meetings; but it does not altogether account for what appeared to be larger attendances than usual.

Another direction in which the meetings of the Association generally may be regarded as exceptional—this is entirely due to the times in which we live—was the general desire for organization in every department of science. In more than one of the Sectional Presidential Addresses hints were thrown out that the Association as a body was disposed to take action; and as the week proceeded a more or less definite state of affairs developed. Indeed, it is not too much to say that it is not at all improbable for the Association to take over the whole organization of the science of the nation—delegating the details to various Sectional Sub-Committees. A perusal of our report of the proceedings below will show how far the idea has progressed.

The main Presidential Address—that read by Professor Arthur Schuster, F.R.S., in the Free Trade Hall on Tuesday night does not directly interest us—it is incidentally referred to in our editorial columns—and we turn to the sections.

By far the most important (to the gas industry) Sectional Presidential Address was that of Professor W. A. Bone to Section B (Chemistry), which was delivered on Wednesday morning. It is given—practically *in extenso*—on pp. 576-82 of to-day's issue.

Section B was the only one to meet on Wednesday afternoon. Professor Harold B. Dixon dealt with the explosion of gases; Dr. H. F. Coward, with the dilution limits of inflammability of mixed inflammable gases with air; and Professor W. A. Bone, with gaseous combustion at high pressures. They were all interspersed with experiments and lantern slides; and to do justice to them needs greater length than either the authors had time at their disposal or we space. Several matters touched upon will doubtless be the subject of communications to other societies under more favourable circumstances as to time.

Smoke Prevention.

On Thursday, in Section B, a discussion took place upon smoke prevention. We pick out the direct references to gas. Professor Bone was in the chair.

The President, in opening the proceedings, remarked upon the importance of the subject, especially in industrial districts. Special interest had been taken in it in Manchester, where almost the first investigation upon the atmosphere of a great city was made some twenty-five years ago at the Manchester University by Dr. G. H. Bailey. This report was very important, historically, apart from its merits. He (Dr. Bone) desired to have it recorded that this report existed.

Mr. E. D. Simon (the Chairman of the Manchester Air Pollution Advisory Board, which was appointed in 1903) said this body had been considering the relative importance of different lines of research in smoke abatement. There were three possible lines of research: (1) Questions relating to the damage done by smoke; (2) improved means for reducing factory smoke; (3) improved means for reducing domestic smoke. While it was computed that the damage done in Manchester and Salford by smoke amounted to £1,000,000 per annum, nevertheless it was felt that the question of damage done was much less important, as a line of research, than the other two lines of research mentioned. It was, however, the domestic problem which seemed to offer the greatest field for laboratory research. This aspect of the subject could be divided into four main branches. First, the variations in efficiency as regards radiation of heat and production of smoke between existing types of coal-burning grates were enormous. Knowledge in this respect was in a very rudimentary stage. Secondly, there was the possibility of the production at a commercial price of a semi-coke or coal, which would burn as cheerfully as coal and as smokelessly as coke. He understood that a new company had been formed to sell such an article, and hoped that it would be successful. Thirdly, there was the adaptation of open fires for the burning of coke. Finally—perhaps most important of all—there were gas-fires. Valuable work was being done in this direction in Leeds, London, and Birmingham; but much remained to be done before a gas-fire was procurable which would give out radiant and convected heat in the best proportions, which would not allow leakage of gas into the room, and which would give the right amount of draught up the chimney. The Manchester Committee having considered these various matters, had undertaken two lines of research. It had decided to join in the national investigation as to the deposition of soot, and was measuring at ten different stations. The second line of research was the fitting-up of a room at the School of Technology for the purpose of carrying out tests on various kinds of domestic heating appliances. This was controlled by Special Sub-Committees including representatives of the City Gas and Electricity Departments, whose co-operation should be of considerable value. The work consisted of the measurement of radiant heat, flue gases, testing gas-fires for leakage, and any other tests which experience might dictate. Promising attempts were already being made to devise a standard method of measuring the total radiant heat given out by a fire. If this were possible, it would greatly facilitate improvements in gas-fires and open coal-fires. If the Board were successful, it would be able to give independent and authoritative advice as to the best type of heating appliance to instal under any given conditions—having regard to questions of cost, heating power, and ventilating effect. At present, the public were thrown back on the advertisements of manufacturers in trying to determine the relative efficiencies of heating appliances; and the work of the Board should enable better guidance to be given to architects and the public than was available at the present time. It should be possible for the Board to make a reasonable charge for any tests made, or advice given; and the department should in time become self-supporting. The most hopeful line of progress was in the endeavour to secure that bituminous coal should not be burned as such, but only after being turned into products which could be smokelessly consumed. With regard to factory smoke, it was not felt that any great progress could be made at present, although the increased use of producer gas was encouraging. In domestic smoke, however, very great progress was to be looked for. It should be possible to confine the coal-fire to the sitting-room; all cooking and bedroom heating should be done by gas or electricity; and it should be possible to ensure that the few open fires that were left should be of a construction which would give off very much less smoke than was at present the case. He did not think this was an impracticable ideal; and if it could be accomplished, it would mean the abolition of the domestic smoke nuisance. The precedent set by the Manchester City Council, in appointing its Board, was a valuable one; and he hoped it would be followed by others. A Central Committee might even be formed, which might very possibly be a Committee of the British Association, to co-ordinate the whole matter. At present, perhaps there was not much to co-ordinate; but such a Committee could do valuable work immediately.

The President, in calling upon Mr. Yates, said that manufacturers of gas-fires had of late gone in for a great deal of scientific investigation. It was not confined to one firm. He had had the pleasure of supplying, from his laboratory, chemists who left him to go to the gas-fire makers; and it was interesting to hear what his late pupils had to say about one another.

Mr. H. James Yates spoke at considerable length on the subject under discussion; and his remarks were of so much importance as to justify giving them apart from this general notice of the proceedings—see p. 586.

The President, referring to the supply of cheap gas, made some strong comments upon the policy of assisting the rates out of the profits of municipal gas undertakings. Sheffield (not a municipality gas supply, by the way) and Birmingham were examples of the right policy, and Glasgow was moving in the same direction. But Manchester continued to tax consumer to the extent of some £50,000 per annum by the "pernicious and senseless custom" of relieving rates out of gas profits. This was the one instance in which Manchester was to be censured for not adopting a sane policy in connection with its municipal affairs. It was a bad policy from every point of view; and he urged the consumers to take steps to compel the Gas Committee to give it up.

Mr. Arnold Lupton said he had calculated that the loss to tradespeople in Leeds through damage by smoke was equivalent to a rate of six shillings in the pound; and he also estimated that the evil could be cured at an expense equivalent to a rate of a shilling. This, however, was in the nature of a prophecy; and he had no means of substantiating it except by experiment, for which the necessary funds were not available. One way towards helping a solution was to punish and reward—*i.e.*, reward those who made no smoke, and not merely punish those who made smoke. He was, of course, speaking from the industrial point of view. To do this it would be necessary to erect watch-towers, from which smoke inspectors could see with telescopes who made smoke and who did not.

Mr. Walter Reid urged the necessity for having manufacturers on any Committee which might be formed. In dealing with the domestic smoke nuisance, advocates of other forms of apparatus than coal were sometimes rather apt to overstate their case. Take, for instance, a block of workmen's dwellings. The tenants were told that, if they put in gas, they would find it so much cheaper, that labour would be saved, and so on. But in such circumstances no labour was saved. This was all right as an argument when there were servants. There were also great difficulties with the gas companies themselves. Only the other day, he had occasion to consider putting in gas in an old office. When he went into the question, however, he found that the cost of the pipes, meters, &c., before he consumed a single cubic foot of gas, was one-and-a-half times as much as the cost of coal for a whole year. These things must be considered. If a cheap appliance was put into the workman's house to burn cheap gas, he would use it. They must not certainly expect such tenants to spend money in having the appliances fitted.

The President, in bringing the proceedings to a close, said that the suggestion for the appointment of a Committee which was now under consideration included not only the prevention of smoke, but fuel economy and the proper utilization of coal.

The Manchester Gas-Works.

The most important paper before Section G (Engineering) was on Thursday, when Mr. J. G. Newbigging, M.Inst.C.E., the Manchester City Gas Engineer, read "Some Notes on the Manchester Corporation Gas Undertaking." See pp. 588.

There was an official visit to the Rochdale Road Gas-Works in the afternoon. As a matter of fact, the works were open to visitors throughout the whole time of the meeting.

Professor H. S. Hele-Shaw's Presidential Address to Section G.

On Wednesday, the President of Section G proposed the formation of a new Committee to deal with scientific and engineering organization. The object of the proposed new Committee would be twofold. The first would be to undertake any work which might be of use in an advisory capacity or by research, or indeed in any other way, for direct assistance in the war. This would be a temporary object of the Committee. With regard to the second object, this stood on rather a different footing. We were, he said, in many respects quite unprepared for the war on which we have entered; and though this offered one of the most powerful arguments in refutation of the charge that we deliberately entered the war for sinister purposes, it would be very disastrous if we repeated our unpreparedness when the war ceases. When peace was concluded, it would only be the prelude to another war, and a war which would recommence with far greater energy on the part of our enemy than before—viz., the war of commerce; and the latter would be almost as serious for us in England as the more sanguinary one. The second and the real object of the proposed Committee, therefore, was to undertake a permanent organization of science in directions in which Germany had achieved such wonderful results. A few of the matters touched upon by Professor Hele-Shaw as affording most ample scope were education, research (there would be prevention of overlapping between institutions and individuals engaged in research), standardization, exhibitions, patents, and general organization. The underlying idea of the scheme, it would seem, would be that the British Association should take over (by means of a Permanent Committee and Sub-Committees) all the research and scientific organization work of the country—work now being carried on in a scattered fashion by numerous investigators. Another subject dealt with in the address—viz., the relationship between employers and employees was dealt with separately later.

Following the Presidential Address on Wednesday, Professor J. E. Petavel submitted a short paper by himself and Professor G. Asakawa, entitled "Experimental Investigations of the Thermal Efficiency of the Gas-Engine"—see p. 590.

Next a short note by Mr. W. M. Thornton, on "The Total Radiation from a Gaseous Explosion," was presented—see p. 590.

On Thursday, after Mr. Newbigging's paper (which appears on p. 588), Mr. E. C. Mills briefly described and exhibited a model of his gas-producer—see p. 590.

THE MONO-RAIL TELPHER.

ITS INSTALLATION, CARE, AND MAINTENANCE.

By H. C. Widlake, M.J.Inst.E., of the Plymouth and Stonehouse Gaslight and Coke Company.

(*Continued from p.* 502.)

Standard Mono-Rail Telpher.

In fig. 6 is shown a photograph of a standard mono-rail telpher by Messrs. Strachan and Henshaw. This machine is suitable for handling almost any class of goods or material—the lifting attachments being specially designed to meet the requirements of the user. The entire weight of the machine is carried upon two free swivelling bogie trucks fitted with manganese steel wheels, the axles of which are carried in roller bearings. The usual hoisting speeds are in the neighbourhood of 60 to 80 feet per minute; while the travelling speeds vary from 500 to 700 feet per minute, according to the work for which the machine is used.

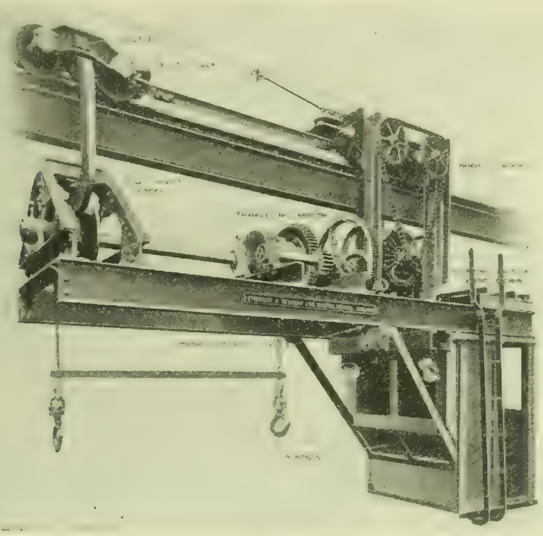


Fig. 6.—Strachan and Henshaw's Mono-Rail Telpher.

The bogie construction enables the machine to negotiate the sharpest curves without the slightest tendency to bind, even with the heaviest loads; the bogies being free to adjust themselves instantly to the slightest change in level or direction of the track. The frames of the machines are made of mild steel throughout—no castings being used structurally; while the whole of the gears are of machine cut steel.

The electrical equipment consists of two series-wound crane motors controlled by a main controller and a change-over switch. The connections between these respective appliances are shown diagrammatically in fig. 7. In many machines these two motors are often quite identical in electrical and mechanical detail—a practice which tends to keep the stock of spare parts at a minimum. Both motors have their armature shafts projecting through the end shield bearings at both ends, so as to form a seating for a pinion or brake drum, according to the purpose for which they may be used.

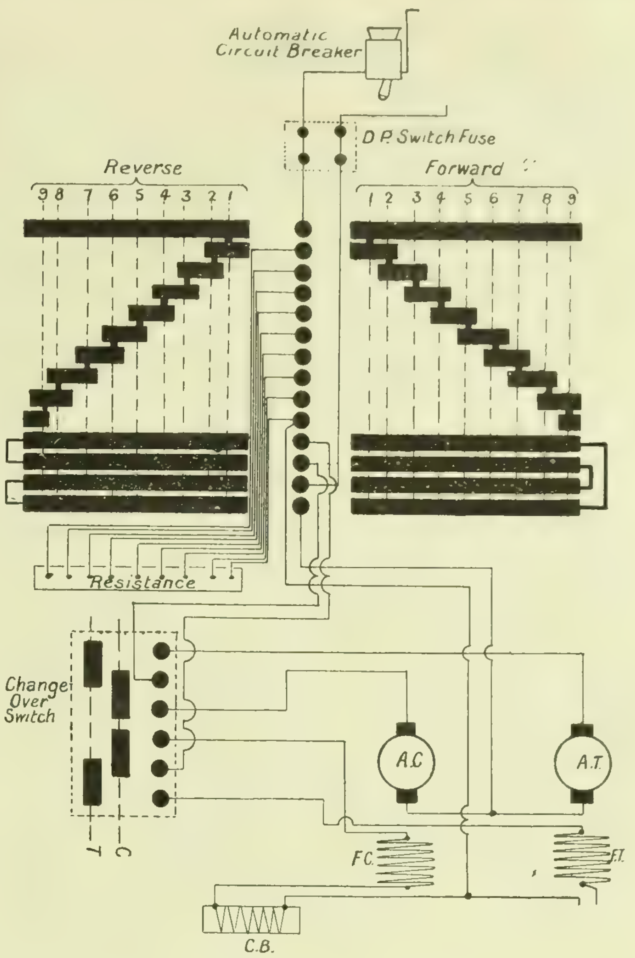
The Travelling Motion.

The travelling motor is generally situated just above the roof of the operator's cab, where it is carried by a large steel plate, which is so secured to the main frame of the machine as to permit of its being readily raised or lowered in order to effect any adjustment in the driving chain. At the end of the motor farthest from the commutator, a pinion keyed on the projecting shaft transmits the power to the track wheels, *viâ* a driving chain and two chain wheels keyed on extensions of the travelling wheel shafts passing through the roller bearings on the side of the bogie truck. The elevation of this chain-drive is in the form of an inverted triangle, the apex of which is formed by the pinion on the travelling motor shaft. The travelling bogie is furnished with toggle brake gear operated by a pedal in the driver's cab.

Hoisting Motion.

The simplicity and efficiency which are the chief characteristics of the travelling gear are among the most striking features of the hoisting motion. The hoisting motor is situated in the body of the machine just above the level, and a little forward, of the driver's head; the axis of the motor being parallel to the horizontal centre line of the telpher. The shaft extension of the armature nearest the driver is fitted with a brake drum, on which a solenoid brake operates in such a manner as to release the motor only when current is passing through its windings.

On the other shaft extension a pinion is seated, and is always in mesh with a spur wheel mounted on a lay shaft at the side of the machine and a little above the motor. This short lay shaft carries at its front end a sliding pinion controlled by a lever inside the cab, by means of which it can be thrown in or out of mesh with the spur wheel on the hoisting drum shaft. This drum is fitted with a substantial hand brake working independently of the electric solenoid brake on the motor and lever controlled from the driver's cab. A special feature of this control is that an interlocking gear renders it impossible to throw the hoisting motor out of gear before the hand brake is applied. One or two—according to the electrical arrangements—small trolley collectors convey the current from the overhead wires to the controller, *viâ* a switch fuse. One set of resistances is employed; and the frame containing the cast alloy grids is situated under the driver's seat—a short run of cables connecting it to the controller.



C. Hoisting Leads. T. Travelling Leads. CB. Hoisting-Motor Selenoid Brake. AC. Hoisting-Motor Armature. AT. Travelling Motor Armature. FC. Hoisting Motor Field. FI. Travelling Motor Field.

Fig. 7.

Change-Over Switch.

On the telpher installation at the works of the Plymouth and Stonehouse Gas Company a special form of change-over switch is employed; and the excellent results given by this appliance quite justify a short description of it, and of the circumstances which led to its design and adoption.

There is at the works an installation of the Fiddes-Aldridge simultaneous charging-discharging machines; the last machine being put down in the autumn of 1913. The engineering staff of the Company, after a close series of observations of the standard "F.A." machine, had arrived at the conclusion that the general handiness and all-round capabilities of the machine would be enormously increased by the use of an additional motor in connection with the travelling gear. In the early part of 1913, a design was drawn up embodying the use of two motors, worked by a master controller and a change-over switch; and an order was placed with Messrs. Aldridge and Ranken for a new machine to be built in accordance with this design.

The machine was built and set to work a few months later, and the excellent results it gives have more than justified this radical departure from Messrs. Aldridge and Ranken's standard design. The capacity of the new machine (No. 83) is at least 25 per cent. in excess of that of the standard machine. Before placing the order for the machine, it was recognized that the change-over switch with which it was intended to equip the new machine might prove a source of trouble, owing to the large number of times which such an appliance would be operated in the ordinary course of the day's work.

On the basis of 22 benches working on eight-hour charges, it was estimated that the change-over switch would be operated 1000 times a day. This calculation was based on the assumption that the operator brought his machine right into the charging position each time, and never over or under shot his mark. This accuracy of operation is, needless to say, not attained in actual practice; it being more probable that, under the conditions outlined, the change-over switch would be operated between 2000 and 3000 times a day.

The general opinion was that there was not a change-over switch on the market which would stand-up to this particular job without giving a great degree of trouble; and a special switch (of which a short description follows) was designed by the author and constructed on these works. Its performance and endurance leave nothing to be desired; and as soon as it proved its worth on the new "F.A." machine, the telpher was equipped with a similar switch with the most gratifying results.

Fig. 8 shows two of these switches—one assembled and the other taken apart—the height of the boxes being about 12 inches. It is practically a double-pole two-way switch arranged on the barrel controller principle. Two gun-metal drums of opposite polarity are keyed concentrically on a gun-metal shaft, and are insulated from it by leatheroid. Each of the drums has three grooves turned around its periphery for the reception of, and in order to ensure the alignment of, the copper contacts secured to the drums by radially projecting screws. A hard-wood carrier fitted the entire length of the cast-iron switch case has mounted upon it six saddle-pieces of gun-metal, whose lower ends form terminals for the reception of the cables; while the upper ends are tapped and screwed for the screws securing the fingers.

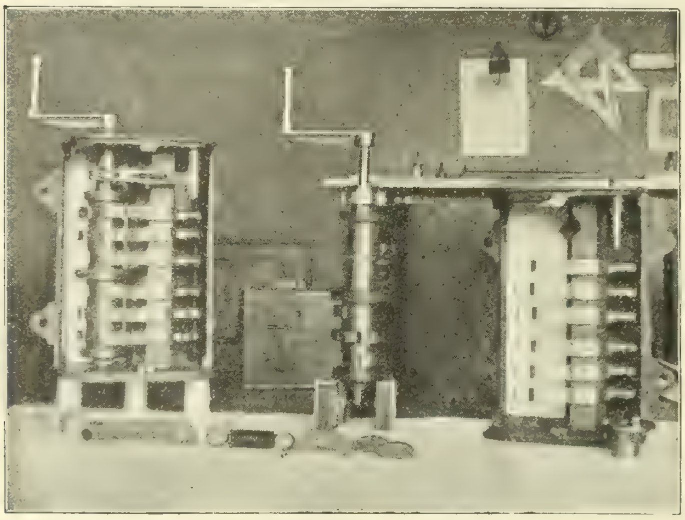


Fig. 8.

A substantial internally contained cam gear prevents the controller barrel being left or vibrating into any position other than its two legitimate ones. All parts are liberally rated; and trouble from this, or indeed, from any other, cause has been practically non-existent during the nineteen months the switches have been used on the Fiddes-Aldridge and the telpher installations at these works. The design can be easily adapted to enable a master controller to control three or four motors *vid* this switch; while provision is made for the use of a magnetic interlocking device, which renders it impossible to operate the switch unless the master controller is in the "off" position.

Maintenance.

The satisfactory operation of any machine depends largely upon the manner in which it is handled and looked after. Periodical inspection can do much to minimize the chances of a breakdown; and while it is obviously impossible to have a telpher working in the neighbourhood of stacks of coal in the same condition as (say) the engines in a generating station, still no effort should be spared to keep the whole of the machine in a reasonable state of cleanliness. This remark applies especially to the neighbourhood of the controller, the motors, switchgear, &c.

The most remarkable feature of these telpher installations is the extremely small maintenance charges involved; and in this connection the author frankly admits that when he came to write under the above heading he felt himself to be somewhat at a loss for material—so small have the maintenance charges been in connection with the plant under his charge for the last few years. This experience is, he believes, by no means uncommon. On a properly controlled plant every machine should come in for regular periodical inspection, the period elapsing between the inspections being dependent upon the working hours of the machine. In the case of a telpher plant handling (say) the coal in an average provincial gas-works, the inspection should be carried out every week or ten days; the following routine being observed:

(1) All grease-cups should be inspected and filled, and all bearings, &c., cleaned.
(2) Travelling and hoisting brakes should be inspected and, if necessary, adjusted, and the electric solenoid brake adjusted in the manner described at length at the end of this section.
(3) The travelling chain should be cleaned, lubricated, and, if necessary, adjusted by raising or lowering the motor.
(4) All nuts and bolts should be inspected and, if necessary, tightened-up.
(5) The end bearings of the motors should be emptied, flushed out with paraffin, and refilled with clean oil after making sure that the lubricating rings are free. Particular care should be taken to see that the oil plugs are tight in the end shields; and if a plug is known to be slack in its thread, it should be replaced.
(6) The motors, controller, change-over switch, fuse-box, circuit breaker, and resistance should be blown out with a strong pair of bellows and thoroughly cleaned.
(7) The motors having been cleaned, the clearances between the pole pieces and the armature core should be taken by means of feelers, the carbon brushes should be tested to see that they are free in their holders, and fresh brushes put in where necessary.
(8) The wear and spring of the contact fingers in both the main controller and the change-over switch should be observed and new contact segments and fingers fitted where necessary; the contacts being lightly smeared over with vaseline before closing-up.
(9) The trolley collectors should be inspected and oiled, and new wheels fitted if necessary. An old wheel, however equally worn, will throw the collector off the wire when travelling, and lead to a smashed collecting gear and perhaps a broken trolley wire.
(10) All electrical connections between the various appliances should be thoroughly tried for tightness; the old electrical axiom being borne in mind "good connections, good results."
(11) The trolley being removed from the wire, the insulation resistance of the entire machine should be taken, and, if low, the various appliances should be disconnected and the faulty portion of the equipment located.

The above list may seem rather formidable; but it will be found easy to get over the entire inspection in two or three hours, while the additional feeling of security gained by so methodical a procedure will more than wipe-out the trifling cost, not to say anything of the incipient defects which may be discovered and put right before a breakdown occurs.

A very simple, yet important, point to observe is to never start inspecting or doing anything to the machine before making sure that the grab is lowered to the ground, the current switched-off the telpher circuit, and the trolley off the wire. A wandering lead taken from some adjacent supply will enable the inspection to be carried out comfortably without the risk of a shock, and the still graver risk of the possible fall from the machine which may follow.

General.—The telphers should, as far as possible, be kept free from dirt and wet, and should be thoroughly cleaned-down once a week at least. All the working parts should be carefully and frequently cleaned, examined, and oiled; special care being taken to see that all the small pins, joints, &c., in connection with both the hand and foot brakes are all quite free and in working order. The "Stauffer" lubricators on the drum-hoist bearings, the intermediate hoist gear bearings, as well as the bearings of all the travelling wheels should be kept well charged with good quality lubricating grease, and a turn given to each periodically, to ensure that the bearings are well supplied with the lubricant.

Brakes.—Before commencing to work, the track brake, which operates on the travelling wheels on the main frame of the telpher, should always be seen to be in working order, and so adjusted that a small movement of the pedal in the driver's cabin ensures the brake being hard on. Should the wood blocks fitted in the cast-iron brake shoes become worn, they should be renewed. The best wood for this purpose is either hornbeam or willow. The solenoid hoisting brake is a rather difficult brake to set; and it is proposed to devote a rather lengthy description of this operation later in this section of the article.

Care of the Ropes.—The ropes should be examined at regular intervals, and a record kept of their condition. The ropes are worked under severe conditions, especially in gas-works where hot coke is dealt with by the telphers, and care must be taken to ensure their longest safe life and to prevent accident. It is advisable to cut off about 18 inches from the end of each rope next to the skip as often as appears necessary—say, every month. This removes the portion of the rope having the heaviest duty and the greatest exposure.

It is also advisable to periodically reverse the ropes—that is, the end fixed to the barrel, which is, of course, unworn, should be detached and fastened to the lifting bale, and *vice versâ*. Special anchor plates and clamping bolts are provided to facilitate the regular removal of the worn end. Special care should be taken to see that these plates are properly tightened-up, and a safety lashing or stop put on the free end of the rope to guard against faulty clamping. The ropes should be kept well lubricated with a grease free from all trace of acid. It must be borne in mind that the wear and tear on the ropes is very heavy; and unless these precautions are taken, it is impossible to get the full life out of them.

Setting the Brake.

Foremost among the adjustments which largely contribute to the satisfactory operation of the machine comes the proper setting of the brake—a rather delicate job, calling for a certain amount of intelligence and skill; and discrimination should be exercised in the choice of the man detailed for this work. The main purpose of the brake is to hold the grab in case of any failure of current while the hoisting motion is in operation—a function which it performs quite independently of the lever-operated brake on the main brake drum. A loosely set brake may allow the load to fall some distance before the driver can get his hand brake into operation; while, on the other hand, a brake which does not properly leave the drum causes the motor to heat, due to increased current consumption, with an accompanying reduction in the economy of the machine, and will, in all probability, lead to a hot bearing at the brake end of the motor, due to mechanical friction. The writer proposes to give a detailed description of the manner in which this brake should be set.

The brake is of the solenoid type, and is so constructed that the passage of current through the motor, with which the brake winding is connected in series, releases the brake drum in the following manner (fig. 9). The outer end of the solenoid engages with a fork in the top of the lever A, which, in common with the trigger B, works on a fulcrum pin C, passing through the outer end of the upper brake block casting. The lever follows the solenoid on its inward stroke, and has cast upon it a step D, which, coming into contact with the adjusting screw E in the trigger, imparts a downward motion to the trigger. The trigger will now give a downward motion to the lower brake block casting (on the extremity of which it rests); and this, moving about the back fulcrum pin I, leaves the drum and comes to a rest when it meets the adjusting screw F. The lower brake casting having completed its stroke, which is limited by the screw F, the top brake casting now commences to lift, until, at the end of the plunger's stroke, both top and bottom brake blocks are quite clear of the drum.

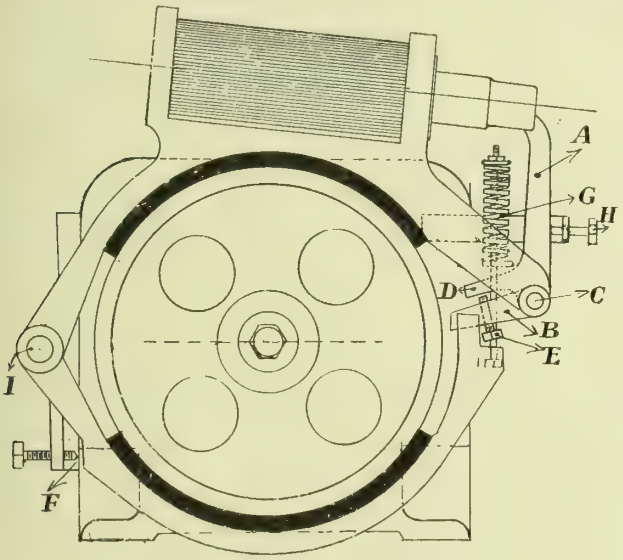


Fig. 9.

Before passing to the setting of the brake, it may be pointed out that the plunger should every fortnight be withdrawn, cleaned, lubricated, the solenoid cleaned, and the plunger replaced. A certain amount of coal dust, &c., is bound to be carried forward with the plunger; and this, unless it is periodically removed, will eventually "bind" the brake. The plunger may be lubricated with vaseline; but under no condition should oil be applied to the brake blocks—a practice which is far from uncommon, and cannot be too strongly condemned. If excessive heating or firing is taking place, it is due to the setting of the brake; and the application of oil to the blocks can only make matters worse.

The top and bottom castings having been set in position as described, the adjusting screw F should be set forward until the bottom brake block is just clear of the drum. The compression spring G must now be put in position and slight tension exerted, which will have the effect of applying both the top and bottom blocks to the drum. The adjusting screw E, in the trigger B, must next be screwed forward until its point is about ⅛ inch away from the step D. The position of the step D may be regulated by means of the screw H, which governs the travel of the solenoid. With new blocks, however, this screw should be so set that, with the point of the screw E just projecting through the trigger B, the distance of ⅛ inch mentioned above is maintained.

The required braking effect may now be attained by regulating the tension of the spring G by means of the tension nuts on the top of the bolt passing through the spring and connecting the top and bottom halves of the brake. All adjusting nuts should be securely locked; and if the blocks are new, the adjustment should for a week or so be followed up daily, until the blocks have bedded themselves to the drum.

Fig. 9 shows a solenoid brake mounted in the regular way—namely, with the solenoid coil on top—on a Siemens "C" type motor. It must be remembered, however, that in the case of a telpher hoisting motor the brake is inverted in the manner shown in fig. 10. In this photograph it will be observed that a separate brake lever and trigger are shown to the right of the illustration; and a study of these two parts, in conjunction with the particulars already given of this brake, will make its action more clear. This method of mounting the brake in an inverted position led, on the plant with which the writer is associated, to a rather awkward mishap.

Referring to fig. 10, it will be seen that the first motion of the brake brings the lower half of the band in contact with the stop F—thus limiting its downward motion; and when this lower portion carries the weight of the solenoid coil, as is the case with a telpher brake, there is a bending strain set up at this point. In the case alluded to, the strain caused a fracture in the band casting. To obviate the possibility of a recurrence of this breakage, a gun-metal bracket, fitted with an adjusting screw, was bolted on the cross channel bearing that end of the motor in such a position that the point of the adjusting screw met the part of the brake fitment marked A in the photograph at the moment the lower element was clear of the drum.

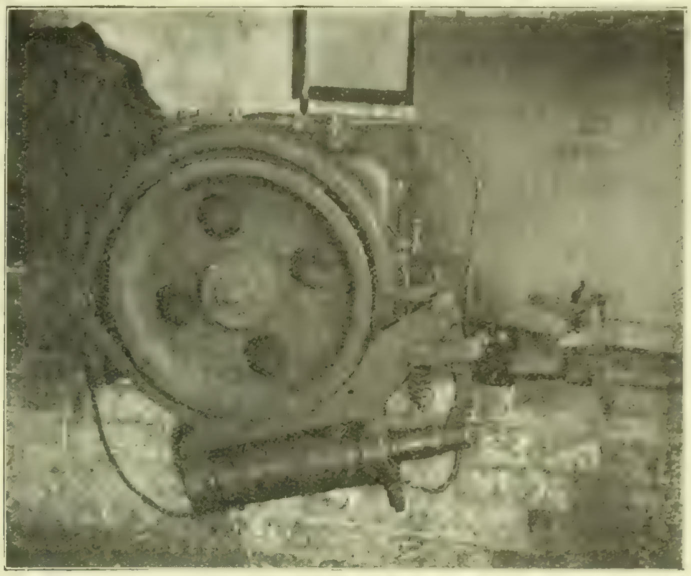


Fig. 10.

The foregoing notes should enable the user of telphers fitted with this type of brake to obtain the maximum amount of efficiency and safety; but it may be remarked that Messrs. Strachan and Henshaw now supply their machines fitted with a brake of their own design.

(To be concluded.)

Sir William H. Lindley.

Several of the English papers last week published a report headed "A Confirmed Englishman," giving a translation of a telegram from Amsterdam in regard to Sir William H. Lindley. In reproducing the telegram, it may be mentioned that this is merely a revival of a statement which was given in the "JOURNAL" as far back as Nov. 17 last, p. 350. The Central News telegram was as follows:—

> The "Kölnische Zeitung" learns that Sir William H. Lindley has been appointed Doctor *honoris causa* of the Darmstadt University. Sir William Lindley is a British subject in the service of the Darmstadt Municipality, and has not been naturalized in Germany. He left Germany for Denmark after the outbreak of the war. The "Kölnische Zeitung" calls him a "confirmed Englishman," and is very indignant that the degree has been conferred upon him.—*Central News.*

◆

Gas Supply in Paris Last Year.—According to the report of the Directors of the Paris Gas Company for the year ended Dec. 31, 1914, the revenue from the supply of gas was 77,030,112 frs.; while the sale of residuals, &c., produced 21,703,230 frs.—showing a total of 98,733,342 frs. (£3,949·334). The expenses for the same period came to 94.556,211 frs. (£3·782,249); leaving 4,177,131 frs. (£167,085) to be handed over to the Municipality of Paris, in accordance with the terms of the concession. The net profit derived by the City from the gas undertaking in the year 1912 was 23,460,816 frs. (£938,433), and in the following year 21,454,266 frs. (£858,170). The year 1914 was an exceptional one owing to the war. Had it not been for this terrible calamity, the profit accruing to the City would, the Directors estimate, have been about 18,750,000 frs. (£750,000). Owing to the disturbed conditions of affairs, the accounts included in the report furnish statistics connected with the supply of gas in the city for the first half of the past year only, and they are compared with the corresponding period of 1913. There was in the six months an increase of 2·2 per cent. in the quantity of gas sold; but on the entire year there was a decrease of 14 per cent. As the consumption fell off considerably after the month of August, the extra cost of coal for the year amounted to only 1,700,000 frs. (£68,000). The Directors' report, as usual, goes very fully into the Company's affairs; and some further particulars from it may be given in a future issue.

PROFESSOR WILLIAM A. BONE'S BRITISH ASSOCIATION ADDRESS.

President of Section B (Chemistry).

An outstanding feature of last Wednesday's proceedings of the British Association at Manchester was the delivery of his Presidential Address to Section B (Chemistry) by Professor William A. Bone, D.Sc., F.R.S., of the Imperial College of Science and Technology, London. He began by asking the indulgence of the members, on account of the extremely short time which was given him to prepare himself for the onerous position which he was asked to fill in the emergency caused by Professor H. B. Baker's inability to preside, owing to his absence in Flanders. All he could, in the circumstances, he added, offer was a review, hastily put together, of recent progress in those branches of chemical science and technological practice in which his own particular work and experience lay. It would necessarily be incomplete, because there had been no time for the careful perusal of some recent memoirs which otherwise he would certainly have wished to refer to. But he would hope to find opportunity of remedying such defects—whether of omission, or of misinterpretation, or of wrong perspective—when revising the address before it finally appeared in the "Annual Reports."

GASEOUS COMBUSTION.

This year is, as many of you are doubtless aware, the centenary of Davy's invention of the miner's safety lamp, which formed the starting-point of his brilliant researches upon flame, in which he disclosed, and brought within the range of experimental inquiry, most of the intricate and baffling problems connected with the fascinating subject of gaseous combustion. Also the ground on which we meet to-day is known to the whole scientific world as the place where, during more than a quarter-of-a-century of continuous investigation, a succession of Manchester chemists, led and inspired by Professor H. B. Dixon, have devoted themselves to the elucidation of the many problems which Davy's work foreshadowed. Therefore, both in point of time and place, the occasion is singularly appropriate for a review of recent advances in this important field of scientific inquiry.

At the Sheffield meeting of the Association in 1910, I had the honour of presenting to a joint conference of Sections A and B (Physics and Chemistry) a report summarizing the then "State of Science in Gaseous Combustion,"* which gave rise to a keen and stimulating discussion, and was not only printed *in extenso* in the annual reports for that year, but was also widely circulated through the medium of the Scientific and Technical Press. There is no need, therefore, for me to refer in any detail to the results of researches already dealt with in that report. I can more usefully devote part of the time at my disposal to supplementing it with a review of more recent researches, which have considerably extended our knowledge in many directions.

IGNITION PHENOMENA.

The first section of my 1910 report was concerned with ignition temperatures and the initial phases of gaseous explosions; and it is in connection with ignition phenomena that subsequent progress has been most marked.

For the ignition of a given explosive mixture, it is necessary that the temperature of its constituents should be raised, at least locally, to a degree at which a mass of gas self-heats itself by combination until it bursts into flame, or, in other words, to a degree at which the chemical action becomes autogenous or self-propelling, so that it quickly spreads throughout the whole mass. This particular degree, or in some cases range, of temperature is commonly spoken of as the ignition-point of the mixture; but in using the expression, certain qualifications should be carefully borne in mind. In the first place, as H. B. Dixon and H. F. Coward showed in 1909,† whereas when certain combustible gases —such, for example, as hydrogen and carbon monoxide, the mechanism of whose combustion is probably of a fairly simple character—and air or oxygen are separately heated in a suitable enclosure before being allowed to mix, the temperature at which ignition occurs lies within a very narrow range, which is, within the limits of experimental error, the same for both air and oxygen [*i.e.*, in the case of hydrogen it is 580° to 590°, and for carbon monoxide 640° to 658°]. On the other hand, in cases where the mechanism of combustion is known to be very complex [*i.e.*, hydrocarbons], the ignition range is either fairly wide or else is materially lower in oxygen than in air (or both). Thus—

	In Air.		In Oxygen.
Methane.	650°–750°	..	556°–700°

The explanation of such behaviour is probably to be sought in the known complexity of the combustion, and the marked tendency for appreciable and fairly rapid interaction between the inflammable gas and oxygen before the actual ignition-point is reached. If, by any means, such preliminary interaction could either be entirely suppressed, or if, on the other hand, it be very rapid in character, the observed "ignition range" would be narrowed, as is actually the case with ethylene [542° to 547° in air, and 500° to 519° in oxygen].

There are two other means by which an explosive mixture may be ignited. One is by adiabatic compression; and the other, and most commonly employed of all, is by the passage of an electric spark. The adiabatic compression of an explosive mixture was originally suggested by Nernst as a means of determining its ignition-point, provided (1) ignition is not produced locally, while the main temperature of the gas is still far below the true ignition temperature, (2) the piston of the apparatus does not move appreciably after the gas has been raised to its ignition-point. At the time of my 1910 report, Falk, in America, had applied the method in the case of hydrogen and oxygen mixtures, with results which, in the light of more recent work, would appear to have been misleading or erroneously interpreted. Thus, for instance, he found that of all the mixtures of hydrogen and oxygen, the equimolecular $H_2 + O_2$ mixture has the lowest ignition temperature (514°), from which he concluded that the gases react initially to produce hydrogen peroxide rather than steam. Such a conclusion, which I believe to be erroneous, naturally directed attention to the experimental method involved.

The subject was promptly taken up here, in Manchester, by H. B. Dixon and his co-workers,* with the result that much new light has been thrown on the phenomena accompanying ignition. The ratio of the ignition temperature to the initial temperature of the mixture before compression, both expressed in degrees absolute, $\left(\frac{T_2}{T_1}\right)$, may be calculated from the compression ratio, $\left(\frac{V_1}{V_2}\right)$, by means of the well-known formula for adiabatic compression:

$$\frac{T_2}{T_1} = \left(\frac{V_1}{V_2}\right) \gamma - 1$$

where γ = the ratio of the specific heats at constant pressure and volume, respectively, of the mixture compressed, and which for a mixture of diatomic gases, such as hydrogen and oxygen, is usually taken as 1·40.

Dixon's recent photographic analysis of the appearance of flame when mixtures of carbon bisulphide and oxygen ($CS_2 + 3O_2$) are adiabetically compressed, have proved that the flame, starting from a point or layer, always takes an appreciable time to spread through the mixture, and that unless special precautions are taken to arrest the piston at the moment of its attainment of the ignition condition, it may be driven in much further than the minimum distance for ignition. The real ignition-point, as above defined, is not necessarily synchronous with the actual appearance of the flame. There may be, and usually is, an appreciable "pre-flame" period. Only in the fastest-burning mixtures is this period negligible; hence the necessity of artificially stopping the movement of the piston at the beginning of the period—a precaution which Falk seems to have neglected.

According to Dixon and Croft's recent determination by this method of the ignition-points of mixtures containing electrolytic gas, whereas successive additions of hydrogen or nitrogen progressively raise the ignition temperature of the undiluted gas by regular increments, as would be supposed, successive additions of oxygen, on the other hand, lower it, as a glance at the following table will show:

Ignition Points of Mixtures Containing Electrolytic Gas by Adiabatic Compression.

[H. B. Dixon and J. M. Crofts, 1914.]

Electrolytic Gas, $2H_2 + O_2$ = 526°.

+ x H_2.		+ x N_2.		+ x O_2.	
x = 1 . .	544°	x = 1 . .	537°	x = 1 .	511°
x = 2 . .	561°	x = 2 . .	549°	x = 7 .	478°
x = 4 . .	602°	x = 4 . .	571°	x = 15 .	472°
x = 8 . .	676°	x = 8 . .	615°		
(526 + 18 x)°		(526 + 11 x)°			

The observed raising effects of successive dilutions with hydrogen and nitrogen call for no comment, save that the relatively greater effect of hydrogen as compared with nitrogen may be attributed to its greater thermal conductivity; but the lowering effect of oxygen is indeed puzzling, and its meaning can only be conjectured. Dixon and Crofts have suggested that it may be due either to the formation of some active polymeride of oxygen under the experimental conditions, which seems to me doubtful, or that the concentration of oxygen in some way or other brings about increased ionization of the combustible gas. This at once raises the larger question of whether or not ignition is a purely thermal problem, as until recently has generally been supposed.

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* See "JOURNAL," Vol. CXI., p. 648.

† *Ibid.* Vol. CVII., p. 323.

* H. B. Dixon, L. Bradshaw, and C. Campbell, "Trans. Chem. Soc.," 1914, 105, 2027; H. B. Dixon and J. M. Crofts, *ibid*, p. 2036.

Professor W. M. Thornton, of Newcastle-upon-Tyne, recently published some very suggestive work on the "Electrical Ignition of Gaseous Mixtures,"[*] which, apart from its theoretical interest, has an important bearing on the safety of coal-mines where electrical currents are used for signalling and other purposes.

The common belief that any visible spark will ignite a given explosive mixture of gas and air is, of course, quite erroneous; for just as Coward and his co-workers have shown that for a given explosive mixture and sparking arrangement there is a certain limiting pressure of the gaseous mixture below which ignition will not take place, so from Thornton's work it would appear that a definite minimum of circuit energy is required before a given mixture at given pressure can be ignited by a spark. And, moreover, he has stated that the circuit energy required for the spark ignition of a given mixture (say) of methane and air is something like 56 times greater with alternating than with continuous current at the same voltage. From this he has argued that the igniting effect cannot be simply thermal, but must be in part at least ionic. This conclusion he further supports with the statement that the igniting power of a unidirectional current is proportional to the current in the case of many gaseous mixtures over an important part of their working range of inflammability.

While there is much that is suggestive in Thornton's work, there is also a good deal which seems very difficult to interpret from a chemical standpoint. I here refer more particularly to his later supposition of "stepped ignition," which is based upon certain observed abrupt increases in the minimum igniting current required with condenser discharge sparks as the proportion of combustible gas in the air mixture examined progressively increases. In other words, it is claimed that continuous alteration of the proportions of gas and air in an explosive mixture is, or may be, accompanied by discontinuous alterations in the spark energy required for ignition. I must confess that, after careful examination of the published curves, I am quite at a loss to give them any chemical interpretation, and to being somewhat sceptical about the supposed "stepped ignition." A repetition and extension of Professor Thornton's experiments would be most valuable as a means to a better understanding of the conditions of spark ignition.

INFLUENCE OF ELECTRONS UPON COMBUSTION.

During the discussion upon my 1910 report, Sir J. J. Thomson reminded us chemists that combustion is concerned, not only with atoms and molecules, but also with electrons moving with very high velocities. They might be a fact of prime importance in such intensive forms of gaseous combustion as are realized in contact with hot or incandescent surfaces, as also in the explosion wave. It is well known, of course, that incandescent surfaces emit enormous streams of electrons travelling with high velocities; and the actions of such surfaces may be due to the formation of layers of electrified gas in which chemical changes proceed with extraordinarily high velocities. Again, the rapidity of combustion in the explosion wave might, he thought, conceivably be due to the molecules in the act of combining sending out electrons with exceedingly high velocities, which precede the explosion wave and prepare the way for it by ionizing the gas.

With regard to this interpretation of the action of surfaces, Mr. Harold Hartley carried out a promising series of experiments in my laboratory at Leeds University upon the combination of hydrogen and oxygen in contact with a gold surface, which lend some support to the idea. But they require further extension before it can be considered as finally proved. It is my intention in the near future to resume the systematic investigation of the matter as rapidly as circumstances permit; but the experimental difficulties are formidable, and the mere chemist working by himself may easily be misled. We badly need the active co-operation of physicists in elucidating the supposed role of electrons in combustion.

Professor H. B. Dixon and his pupils have, at Sir J. J. Thomson's suggestion, recently tested the idea as applied to the explosion wave, with, however, negative results.[†] It is known, of course, that the motion of the ions can be stopped at once by means of a transverse magnetic field, in which they curl up, and are caused to revolve in small circles; and the question which Professor Dixon decided to put to the test of experiment was whether the damping of the electronic velocities in a powerful magnetic field would have any appreciable effect either upon the initial phase of an explosion or upon the high velocity of detonation. But though he employed a very intense magnetic field produced by some powerful magnets specially constructed by Sir Ernest Rutherford for the deflection of electrons of high velocity, no appreciable effect was observed upon the character or velocity of the flame with any gas mixture at any stage of the explosion. And inasmuch as the high constant velocity of the explosion wave can be entirely accounted for on the theory of a compression wave liberating the chemical energy as it passes through the gases, there seem as yet to be no experimental grounds for attributing it to the ionizing action of electrons.

THE INITIAL PERIOD OF "UNIFORM MOVEMENT" OR "INFLAMMATION" OF FLAME THROUGH INFLAMMABLE MIXTURES, AND LIMITS OF INFLAMMABILITY.

Mallard and Le Chatelier, in their classical researches upon the combustion of explosive mixtures, discovered that the propagation of flame, when such a mixture is ignited in a horizontal tube, differs according as whether the ignition occurs near the open or closed end of the tube. In the first case, the flame proceeded for some distance down the tube at a practically uniform and fairly slow velocity, corresponding to the true rate of propagation "by conduction." This period of uniform movement is succeeded by an irregular oscillatory period, in which the flame swings backwards and forwards with increasing amplitudes—finally either dying out altogether or else giving rise to detonation. With certain oxygen mixtures, the initial period of uniform slow velocity was shorter, and appeared to be abruptly succeeded by detonation without the intervention of any oscillatory period. When, however, such mixtures were ignited near the closed end of a horizontal tube, the forward movement of the flame was continuously accelerated from the beginning, under the influence of reflected compression waves, until detonation was set up. Such, in general, was the sequence of the phenomena that were observed by these distinguished French investigators.

They proceeded to determine experimentally the velocities of the uniform slow movement of the flame in the case of a number of air and combustible gas mixtures, and plotting their results (in c.ms. per sec.) as ordinates against percentages of inflammable gas as abscissæ, they obtained "curves" which were in each case formed of two inclined straight lines converging upwards to a point which represented the composition and flame velocity of the most explosive mixture. And they concluded that the points at which the downward production of the two lines met the zero velocity line would define the upper and lower limits of inflammability for the particular series of gas-air mixtures. Thus the curve they obtain for methane-air mixtures was as fig. 1, showing a maximum velocity of 61 c.ms. per second for a mixture containing about 12·2 per cent. of methane, with lower and upper limits corresponding to 5·6 and 16·7 per cent. of methane respectively.

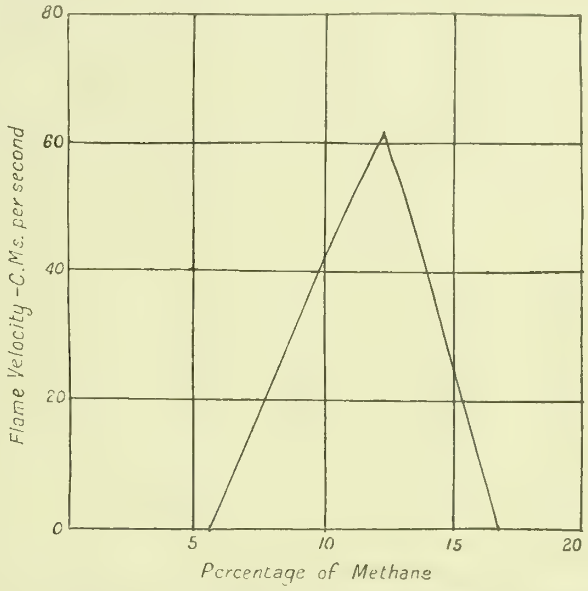

Fig. 1.—Mallard and Le Chatelier's Curve for Velocities of Inflammations on Methane-Air Mixtures.

An exact knowledge of the velocities of flame propagation during this initial period of uniform slow movement, as well as of the limits of inflammability for mixtures of various combustible gases and air, is very important from a practical point of view. Makers of apparatus for burning explosive mixtures of gas and air want to know the speed of flame propagation through such mixtures, not only at ordinary temperatures and pressures, but also when the mixtures are heated and used at higher pressures. Also, it would be important to know whether or not, in the case of a complex mixture of various combustible gases and air, when complete composition can be determined by analysis [as, for example, coal gas and air], the velocity of flame propagation can be calculated from the known velocities for its single components. Unfortunately, although more than thirty years have elapsed since Mallard and Le Chatelier's work was published, the necessary data are still wanting to answer such questions; and anyone who will systematically tackle the problem and carefully work it out in detail will be doing a real service to the gas-using industry. I am hoping shortly to make a beginning with such an investigation in my new department at the Imperial College, London; but the successful and rapid progress of such work will involve considerable financial outlay, as well as organization and expert direction. Who will help us with the necessary funds?

An accurate knowledge of the behaviour of methane-air mixtures under known variations of conditions is of prime importance from the point of view of the safety of coal mines; and it is rightly occupying the attention of my friend and former collaborator, Dr. R. V. Wheeler, at the Home Office Experimental Station at Eskmeals. From papers which he has already published, as well as from some unpublished results which he has very kindly permitted me to refer to in this address, it is now possible to correct certain errors in Mallard and Le Chatelier's results, and to arrive at a clearer view of the phenomena as a whole.

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[*] "Proc. Roy. Soc.," A., Vol. 90, 1914, p. 272; Vol. 91, 1914, p. 17.

[†] "Proc. Roy. Soc.," 1914, Section A., Vol. 90, p. 506.

In the first place, it would appear that the initial "uniform movement" of flame in a gaseous explosion, or, in other words, propagation of the flame from layer to layer by conduction only (as defined by Le Chatelier), is a limited phenomenon, and is only obtained in tubes of somewhat small diameter—wide enough, however, to prevent appreciable cooling of the flame, but narrow enough to suppress the influence of convection currents. Moreover, ignition must be either at or within one or two centimetres of the end of the tube; otherwise—particularly with the more rapidly moving flames—vibrations may be set up right from the beginning.

While all methane-air mixtures develop an initial uniform slow flame-movement period when ignited at, or near, the open end of a horizontal tube, both its linear duration as well as the flame velocity are not, according to private information which Dr. Wheeler has sent me, independent of the dimensions of the tube. The speed of flame increases with the diameter of the tube; and the linear duration of the uniform period increases with both the diameter and length of the tube up to a certain maximum, after which increased length probably makes no appreciable difference. Also, for the same tube, it varies with the proportion of methane in the explosive mixture—being greater as the speed of the flame diminishes, until with the two "limiting" explosive mixtures it appears to last almost indefinitely.

Dr. Wheeler's recent re-determination of the velocities of the flame movement during this initial uniform period for mixtures of methane and air in varying proportions within the limits of inflammability, has revealed serious erorrs in Mallard and Le Chatelier's original results for horizontal tubes of the same diameter as those which Dr. Wheeler has employed. Moreover, Mallard and Le Chatelier's method of determining the composition of the upper and lower limits of inflammability by extrapolation from their curves has been proved to be unwarranted. Dr. Wheeler considers the length of the tubes used by Mallard and Le Chatelier (1 metre only) was insufficient to ensure that the speed measurements of the initial uniform flame-movement period were unaffected by the subsequent "vibratory period." Also, the methane used by them, prepared as it was from sodium acetate, would obviously be impure.

The most important differences between the latest results published by Dr. Wheeler and those originally determined by Mallard and Le Chatelier, as shown on the accompanying diagram (fig. 2), are as follows:—

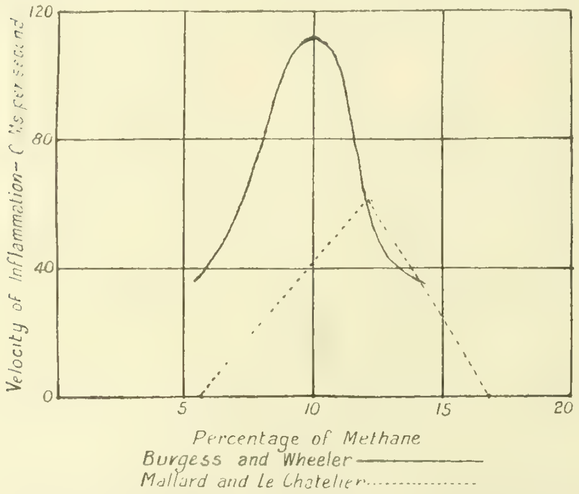

Fig. 2.—Burgess and Wheeler's and Mallard and Le Chatelier's Results Compared.

(1) According to Wheeler, the limits of inflammability for horizontal propagation of flame in methane-air mixtures, at atmospheric temperature and pressure, correspond to 5·4 and 14·3 per cent. methane content respectively; whereas Mallard and Le Chatelier gave 5·6 and 16·7 per cent.

(2) Whereas, according to Mallard and Le Chatelier, the flame velocities for mixtures near the upper and lower limits would gradually approximate to the zero velocity ordinate, as the limiting composition was approached, according to Wheeler the velocities for both the upper and lower limiting mixtures are considerable (in each case about 36 c.ms. per second; and there is an abrupt change from these velocities to zero velocity as the particular limiting composition is passed.

(3) Whereas Mallard and Le Chatelier found a maximum velocity of 63 c.ms. per second for a mixture containing about 12·2 per cent. of methane, and rapid falling off in velocity as this particular composition is deviated from, Wheeler finds a maximum velocity of 110 to 112 c.ms. per second for a series of mixtures containing from 9·45 to 10·55 per cent. of methane. Such differences as are thus disclosed only emphasize the need of a complete experimental revision of the subject.

Messrs. Burgess and Wheeler have recently determined the limits of inflammability of methane when mixed, at atmospheric temperature and pressure, with "atmospheres" of oxygen and nitrogen containing less oxygen than ordinary air. From their results [see below], it would appear that, as the oxygen content of the atmosphere is reduced, the limits of inflammability are narrowed until they coincide when the oxygen content falls below 13·3 per cent., which means that an atmosphere containing 13·3 or less per cent. of oxygen is truly extinctive for a methane flame at ordinary pressures.

Atmosphere.			Methane, per Cent.		
Oxygen.		Nitrogen.		Lower Limit.		Higher Limit.
20·90	..	79·10	..	5·60	..	14·82
17·00	..	83·00	..	5·80	..	10·55
15·82	..	84·18	..	5·83	..	8·96
14·86	..	85·14	..	6·15	..	8·36
13·90	..	86·10	..	6·35	..	7·26
13·45	..	86·55	..	6·50	..	6·70

BEHAVIOUR OF WEAK MIXTURES OF GASES AND AIR.

My review of this part of the subject would be incomplete without a reference to some interesting observations which have been made by Dr. H. F. Coward and co-workers at the Manchester School of Technology, upon the behaviour of weak mixtures of various inflammable gases and air, at or just below the lower limit of inflammability in each case.* Their principal experiments were carried out in a rectangular box of 30 c.m. square section and 1·8 metres length, with two opposite sides of wood, and the other two of plate glass. The box was placed in an upright position; the bottom being water-sealed and the top closed, with a suitable igniting device placed near the bottom. They have shown that caps or vortex rings of flame may be projected for some distance upwards from the source of ignition—sometimes apparently for an indefinite distance, without igniting the whole of the combustible mixture. In such mixtures there may be an indefinite upward slow propagation of flame, together with incompleteness of combustion [much of the combustible mixture remaining unburnt]; and the question very naturally arises as to how the term "inflammability" should be scientifically defined. Dr. Coward has argued, with some force, that a gaseous mixture should not be termed "inflammable" at a given temperature and pressure, unless it will propagate flame indefinitely—the unburnt portion being maintained at that temperature and pressure. Inflammability thus defined would be a function of the temperature, pressure, and composition of a particular mixture only, and would be independent of the shape and size of the containing vessel; and provided that it is kept in mind that for each particular mixture at a given temperature and pressure a certain minimum igniting energy and intensity is requisite, I am inclined to agree with the definition. Also, there is a possibility that in a mixture just at, or very near, one or other of the limits of inflammability, flame may be propagated upwards, but not downwards.

From his experiments, Dr. Coward has assigned the problems as the lower limits of inflammability of hydrogen, methane, and carbon monoxide respectively, in air at atmospheric temperature and pressure:

	Per Cent.
Hydrogen	4·1
Methane	5·3[a]
Carbon monoxide	12·6

[a] Too much stress need not be laid upon the difference between this number and the 5·6 per cent. given by Dr. Wheeler (*loc. cit.*), because Dr. Coward himself admits that the flames of mixtures containing from 5·3 to 5·6 per cent. of methane are very sensitive to shock; while a 5·6 per cent. mixture will always propagate flame indefinitely, even when there is a moderate disturbance. The conditions must be exceedingly tranquil to prevent extinction in the other cases.

COMBUSTION OF HYDROCARBONS AND RELATIVE AFFINITIES OF METHANE, HYDROGEN, AND CARBON MONOXIDE RESPECTIVELY FOR OXYGEN IN FLAMES.

Under the title of "Gaseous Combustion at High Pressure," I have recently published, in conjunction with various collaborators,† a further instalment of my researches on the mechanism of hydrocarbon combustion;‡ and I may perhaps be allowed to draw your attention to certain new points which have arisen in connection therewith.

A detailed study of the behaviour of mixtures of methane and oxygen, of composition ranging between $2CH_4 + O_2$ and $CH_4 + O_2$, when exploded in steel bombs at initial pressures of 12·7 atmospheres [see the following table], has shown it to be consistent with the "hydroxylation" theory of hydrocarbon combustion which I put forward some years ago as the result of my previous work. The following scheme seems to interpret correctly the chemical and thermal changes involved in the initial stages of the explosive combustion of methane.

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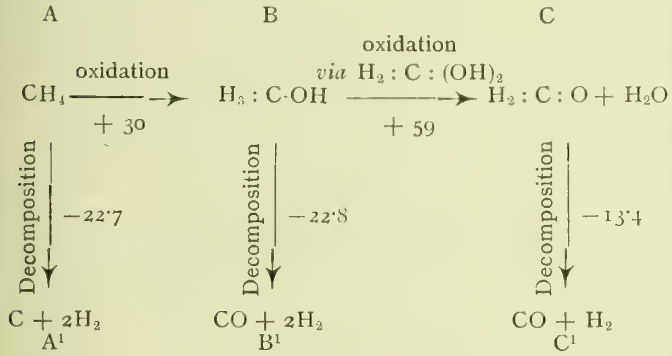
* "Trans. Chem. Soc.," 1914, Vol. 105, p. 1859.

† Messrs. Hamilton Davies, H. H. Gray, H. H. Henstock, and J. B. Dawson.

‡ Phil. Trans. Roy. Soc., "A.," Vol. 215 (1915), pp. 275 to 318.

Explosion of Mixtures of Varying Composition between $2CH_4 + O_2$ *and* $CH_4 + O_2$ *in Bomb "A" at Initial Pressure 12·7 Atmospheres.*

Experiment No.	10.			11.			12.			13.		
Pressures in atmospheres p_1	12·74			12·72			12·68			12·61		
Pressures in atmospheres p_2	15·05			18·10			17·30			14·10		
p_2 p_1	1·18			1·42			1·36			1·12		
	Per Cent.	Partial Pressures, Atmospheres.		Per Cent.	Partial Pressures, Atmospheres.		Per Cent.	Partial Pressures, Atmospheres.		Per Cent.	Partial Pressures, Atmospheres.	
Original mixture CH_4	67·15	8·55		59·3	7·54		55·75	7·09		50·8	6·40	
Original mixture O_2	32·85	4·19		40·7	5·18		44·25	5·59		49·2	6·21	
	Per Cent.	Partial Pressures, Atmospheres.		Per Cent.	Partial Pressures, Atmospheres.		Per Cent.	Partial Pressures, Atmospheres.		Per Cent.	Partial Pressures, Atmospheres.	
Gaseous products CO_2	3·10	0·47		2·70	0·49		3·85	0·67		7·45	1·05	
Gaseous products CO	25·40	3·83		35·60	6·44		37·25	6·44		38·50	5·44	
Gaseous products CH_4	16·60	2·50		4·65	0·84		2·25	0·39		*Nil*	*Nil*	
Gaseous products H_2	54·90	8·26		57·05	10·32		56·65	9·80		51·05	7·60	
	C.	H.	O.	C.	H.	O.	C.	H.	O.	C.	H.	O.
Units in original mixture	8·55	17·10	4·19	7·54	15·08	5·18	7·09	14·18	5·59	6·40	12·80	6·21
Units in gaseous products	6·80	13·26	2·38	7·77	12·00	3·71	7·50	10·58	3·89	6·49	7·60	3·77
Difference atmospheres	1·70	3·84	1·81	—	3·08	1·47	—	3·60	1·70	—	5·20	2·44
Difference per cent.	20		43·2			28·4			30·4			38·2
Ratio $\frac{CO \times OH_2}{CO_2 \times H_2}$ in products	3·65			3·75			3·43			3·4		
Remarks	Explosions almost inaudible; carbon deposited.			Explosion distinctly audible. No carbon deposited.						Very violent explosion with sharp metallic click. No carbon deposited.		



The principal experimental facts which this—or, indeed, any alternative—scheme must explain are :

(1) That whenever mixtures of composition between $2CH_4 + O_2$ and $CH_4 + O_2$ are exploded under pressure, a considerable proportion of the original oxygen appears as steam in the products.

(2) That there is a marked minimum in the proportion of such oxygen as the composition of the original mixture approximates to $3CH_4 + 2O_2$.

(3) That there is a total cessation of any separation of carbon [which is very marked with mixtures $2CH_4 + O_2$] after the proportion of oxygen in the original mixture attains or exceeds the limit $3CH_4 + 2O_2$.

Now if, as I believe, the initial interaction of methane and oxygen is at all temperatures essentially a "hydroxylation" process, accompanied by the decomposition [more or less rapid according to the temperature] of the primarily formed hydroxylated molecules, a consideration of the chemical and thermal aspects of the process will point to certain possibilities which are, indeed, actually realized in fact.

In the first place, monohydroxymethane (methyl alcohol) $CH_3.OH$, is known to decompose at high temperature, yielding carbon monoxide and oxygen, without any separation of carbon or formation of steam, $CH_3.OH = CO + 2H_2$. Also, the very unstable dihydroxymethane, $H_2 : C : (OH)_2$, would yield formaldehyde and steam, $H_2 : C\,(OH)_2 = H_2 : C : O + H_2O$; and the formaldehyde would in turn decompose into carbon monoxide and hydrogen, $H_2 : C : O : = CO + H_2$, without any deposition of carbon whatever.

If now the thermal consequences of such facts be considered, it would appear (1) that the oxidation of methane to $H_3 : C.OH$ [A to B in the scheme] were accompanied by thermal decomposition at this stage (B to B^1), the net heat evolution would be (30 − 22·8) = 7·2 kilogram Centigrade units; whereas (2) of the same amount of oxygen reacted in such a way that there was a "non-stop" run through the monohydroxy to the dihydroxy stage, with decomposition at the point [A to C and C to C^1], the corresponding net heat evolution would be $\frac{1}{2}(30 + 59 - 13·4) = 37·8$ units, or about five times as much as in (1). Hence, there would always be a strong tendency for such a non-stop run from A to C through B, without any decomposition occurring at B; and such would always occur whenever the oxygen present in the original mixture attained the equi-molecular proportion $CH_4 + O_2$.

Again, if the original mixture contained only one-half such proportion of oxygen ($2CH_4 + O_2$), there would still be a decided preference for an oxidation of half of the methane by a non-stop run A to C through B, rather than an oxidation of the whole of the methane to B only—the other half of the methane remaining unchanged, or undergoing thermal decomposition into its elements, $CH_4 = C + 2H_2$ (A to A^1). Also the latter process would use up no more of the energy developed from the oxidation than would be required for the decomposition of a corresponding quantity of $H_3 : C.OH$ at stage B (B to B^1). Hence, when such a mixture $2CH_4 + O_2$ is exploded under pressure, the formation of carbon and its oxides, hydrogen, and considerable quantities of steam may be expected, which is precisely what actually occurs.

When, however, the proportion of oxygen in the original mixture reaches the limit $3CH_4 + 2O_2$, while it is still insufficient to oxidize the whole of the hydrocarbon to the dihydroxy stage, there is enough of it to prevent any methane remaining unoxidized to (at least) the monohydroxy stage; and therefore, seeing that the affinity of methane for oxygen far exceeds those of either hydrogen or carbon monoxide, it is to be expected that no substantial proportion of the original methane would escape oxidation to either the mono- or the di-hydroxy stage. But inasmuch as not more than about one-third of the original methane could, in the circumstances, be transformed into the dihydroxy stage, it follows that a considerable amount of thermal decomposition at the monohydroxy stage would occur.

If this view is correct, it follows that there should be an entire suppression of carbon deposition at or about the $3CH_4 + 2O_2$ ratio; and, also, that with this particular mixture a smaller proportion of the original oxygen should appear as steam in the products than would be the case with either the $2CH_4 + O_2$ or the $CH_4 + O_2$ mixture, which, again, is precisely what we find.

In considering the question of the explosive combustion of hydrocarbon, it is important to distinguish between (1) the primary oxidation of the hydrocarbon, which is an exceedingly rapid process, and is probably completed during the short interval between ignition and the attainment of maximum pressure, and (2) certain probable secondary interactions where influence may extend far into the subsequent cooling period; for it is only this latter which would be affected by variations in the rate of cooling down from the maximum temperature. Such secondary interaction may include the reversible change $CO + OH_2 = CO_2 + H_2$, and, in cases where carbon is deposited as the result of the decomposition of primary oxidation products, the interaction of steam and carbon $C + OH_2 = CO + H_2$. In this connection, I may draw attention to the recently published work of G. W. Andrew,* one of my former pupils and collaborators, on the "Water-Gas Equilibrium in Hydrocarbon Flames," which proves that, in a system containing only CO_2, CO, H_2, H_2O, rapidly cooling down from the high temperatures prevailing in hydrocarbon flames, the equilibrium ratio $\frac{CO \times OH_2}{CO_2 \times H_2}$ adjusts itself automatically with the temperature until a point between 1500° and 1600° C. on the cooling curve is reached [corresponding to a value K = 4·0 approximately], after which no further readjustment occurs. He also found that this adjustment of equilibrium is not greatly influenced, even when relatively large quantities of methane and carbon are found in the final products.

I am able, from my own experiments, to confirm Andrew's conclusions in all cases where the initial firing pressure is insufficient to set up detonation. But in cases where both detonation and separation of carbon occur, my results undoubtedly indicate an appreciable intervention of the separated carbon during the cooling period. There is nothing in my results, however, suggestive of an appreciable intervention of methane.

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* "Trans. Chem. Soc.," 1914, Vol. 105, pp. 444-456.

The fact that the primary oxidation of methane usually involves a direct transition from $CH_4 + O_2$ to $CH_2(OH)_2$, which latter breaks up into, ultimately, $CO + H_2 + H_2O$, without deposition of carbon, opened up the possibility of instituting a direct experimental comparison between the relative affinities of methane and hydrogen for oxygen in explosion, by exploding a series of mixtures $CH_4 + O_2 + xH_2$ in which the hydrocarbon and oxygen were initially present in as nearly as possible equi-molecular proportions, but in which x [the volume ratio of H_2 to CH_4] was varied between 2 and 8, and determining (1) the oxygen distribution on explosion when $x=2$, and (2) the influence upon such distribution of successive equal increments of x up to 8.

Ever since Davy's experiments in flame, the combustibility of hydrogen has been erroneously considered to be superior to that of methane; but, on the other hand, my previous researches upon hydrocarbon combustion have shown (1) that in slow combustion in borosilicate glass bulbs at temperatures between 300° and 400° C., methane, ethane, and acetylene are all oxidized at a much faster rate than in hydrogen or carbon monoxide, and also (2) that, in exploding such mixtures as $C_2H_4 + H_2 + O_2$ or $C_2H_2 + 2H_2 + O_2$, the hydrocarbon is burnt in preference to hydrogen—facts which are at variance with any notion of the superior affinity of hydrogen for oxygen in flames.

My further experiments upon the relative affinities of methane and hydrogen for oxygen in explosives were carried out at high initial pressures in two special steel bombs—namely, A, with a cylindrical explosion chamber, 8 inches long and 1 inch in diameter [capacity = *circa* 103 c.c.]; and, B, with a spherical cavity 3 inches in diameter [capacity = *circa* 275 c.c.]. The ratio of wall surface of the explosion chamber in the case of bomb A would thus be about 2·75 times that of bomb B. The mean results for the distribution of oxygen between methane and hydrogen in the two sets of experiments were as in the next table.

It is at once quite evident, from the results with the mixture $CH_4 + O_2 + 2H_2$, that the affinity of methane is at least twenty to thirty times greater than that of hydrogen for oxygen in explosion flames. The actual distribution of oxygen when a particular mixture is exploded, is undoubtedly influenced to some extent by the walls of the containing vessel, but not, so far as I have been able to ascertain, by the absolute initial pressure. Moreover, it is evident that the influences of successive increases in x, the volume ratio of H_2 to CH_4 in the mixture exploded, upon the actual oxygen distribution for a given explosion, is proportionate to x^2, which can hardly mean other than that in explosion flames hydrogen is directly burnt to steam, and not, as many have supposed, *viâ* the intermediate formation of hydrogen peroxide.

Oxygen Distribution if Mixtures $CH_4 + O_2 + xH$ *are Exploded.*

x		2	4	6	8
		Per Cent.	Per Cent.	Per Cent.	Per Cent.
Bomb A	O_2 to CH_4 .	95·34	81·0	54·9	31·4
	O_2 to H_2 .	4·66	19·0	45·1	68·6
Bomb B	O_2 to CH_4 .	97·1	91·0	72·6	—
	O_2 to H_2 .	2·9	9·0	27·4	—

A similar series of experiments with mixtures $CH_4 + O_2 + xCO$ show that, while it is impossible, owing to circumstances which I need not here detail, to deduce, even approximately, any numerical relation between the affinities of methane and carbon monoxide for oxygen in flames, yet we can confidently say that the affinity of the hydrocarbon is again vastly the superior, although carbon monoxide is apparently more effective than hydrogen in pulling away oxygen from the predominating attraction of methane.

Having thus satisfactorily disposed of the question of the relative affinities of the three gases for oxygen in explosion flames, it remained to prove whether or not such chemical factors determine the ratio of attainment of maximum pressure in explosives, by exploding mixtures of each of the three combustible gases with air, in such proportions as correspond with the primary oxidation—namely, (1) $CH_4 + O_2 + 4N_2$, (2) $2H_2 + O_2 + 4N_2$, and (3) $2CO + O_2 + 4N_2$—at initial pressures of 45 to 50 atmospheres in the spherical bomb B, to which was attached a Petavel recording manometer with its optical accessories.

The pressure records which are reproduced in the following diagrams (figs. 3, 4, and 5) in which pressures in atmospheres are

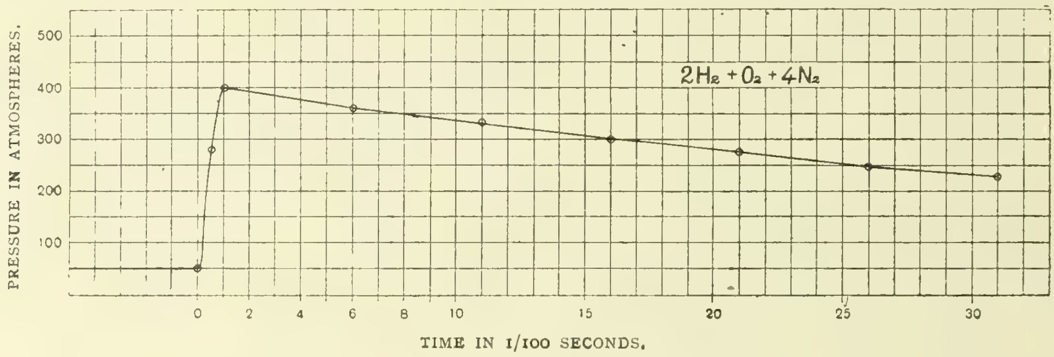

Fig. 3.

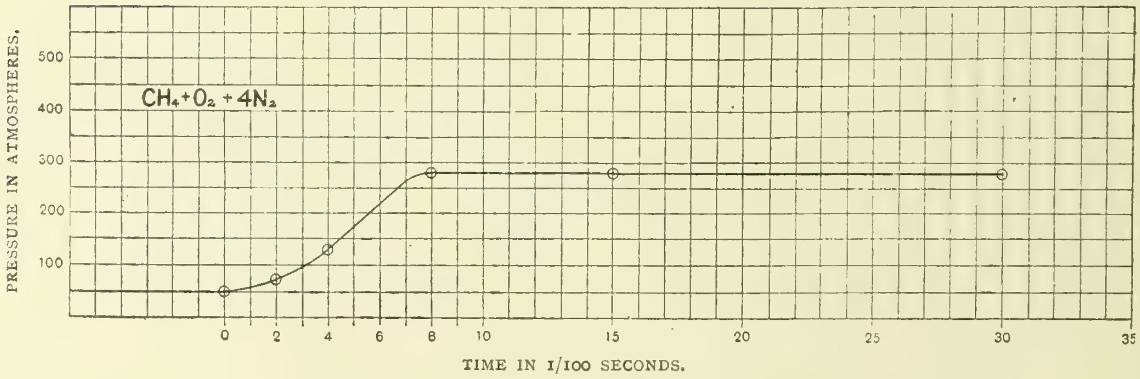

Fig. 4.

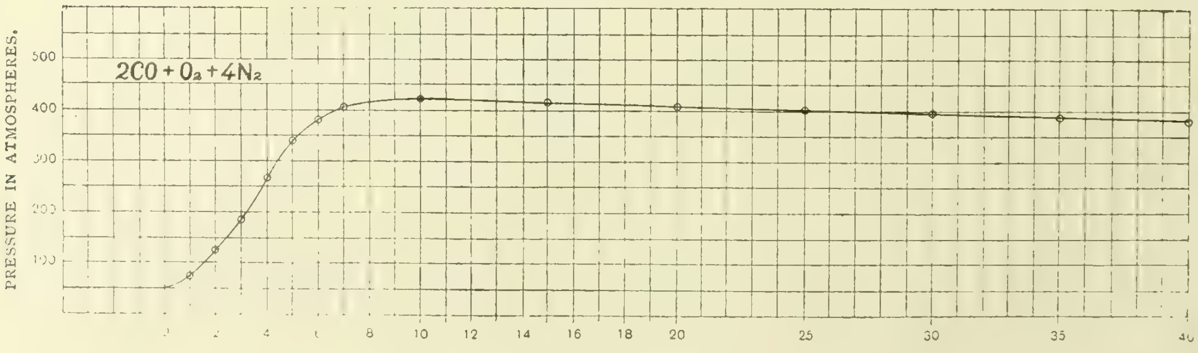

Fig. 5.

plotted against time in seconds, prove conclusively the absence of any direct relation between the actual rate at which the potential energy of an explosive mixture is transferred on explosion as sensible heat to its products, and the magnitude of the chemical affinity between its combining constituents. This is hardly to be wondered at, seeing the extreme rapidity of chemical interaction at high temperature as compared with the rate at which the liberated heat be communicated to, and uniformly distributed among, the products by ordinary physical processes. Attention may be drawn to the extreme slowness of the cooling in each case after the attainment of maximum pressure. This has also been observed by previous workers in other similar cases of gaseous explosions. This was particularly marked in the case of the methane-air mixture, in which there was hardly any appreciable cooling during an interval of 0·22 seconds after the attainment of maximum pressure [in 0·08 second], a circumstance which may be due in part to the combustion taking place in well-defined chemical stages, and in part also to the operation of the exothermic secondary interaction between carbon monoxide and steam during the cooling period. On the other hand, the curve for the hydrogen-air mixture, where the combustion to steam is a direct and comparatively simple transaction, suggests that the attainment of maximum pressure is succeeded by a period of gradual cooling uninfluenced by chemical combination.

FUEL ECONOMY AND THE PROPER UTILIZATION OF COAL.

Leaving now the scientific aspects of flame and combustion, I wish to say a few words as a technologist upon the great national importance of a more adequate scientific control of fuel consumption and the utilization of coal generally, with special reference to the situation created by this terrible and ruinous European conflict. And my remarks will be addressed in part to my chemical friends and colleagues, who are primarily interested in scientific research and its industrial applications, and in part also to the commercial and manufacturing community which is chiefly interested in the financial results of such scientific activity.

Notwithstanding the fact that we are raising annually in the United Kingdom—according to the official estimate for 1913—287 million tons of coal, of which 189 million tons (or, say, 4 tons per head of the population) were consumed at home, more or less wastefully, it is indeed surprising how little has been done, or is being done, by the scientific community to impress upon the Government and the public generally, the importance of establishing some systematic control or investigation of fuel consumptions in all large industrial areas. Deputations have waited upon the Government about the question of reviving our languishing coal-tar colour industry; so that in future we may be independent of Germany for the supply of the £2,000,000 of dye-stuffs required by our textile industries; and already a State-aided organization, with an Advisory Scientific Committee, has sprung into existence to achieve this desirable result. But no organized body of scientific men, so far as I know, has ever thought it important, or worth while, to take an active interest in the vastly greater subject of fuel economy and the proper utilization of coal, upon which the dyeing industry depends for its raw material.

It is unnecessary for me to remind you that the contending armies in this Armageddon of the nations depend upon certain distillation products of coal for their supplies of high explosives; and there is little doubt in my mind but that Germany's violation of the neutrality of Belgium, and her subsequent seizure of that country and of a large tract of Northern France, had more than a purely political or strategic significance. She, doubtless, wanted also to seize for herself (and at the same time to deprive her enemies of) coalfields lying just beyond her own borders, which are capable of furnishing abundant supplies of coal admirably adapted for yielding the raw materials for the manufacture of high explosives. A country in which all metallurgical coke has for years past been manufactured under chemical supervision in bye-product coking-ovens, with recovery of ammonia, tar, and benzol, and in which the wasteful beehive coking ovens have long ago ceased to exist, was hardly likely to overlook the military importance of the Belgian coalfield with its many bye-product coking plants. And, moreover, but for German commercial acumen and enterprise, during many years past, our own bye-product industry would not have attained even to its present respectable dimensions. Certainly it owes very little to the interest or attentions of British chemists, most of whom are, unfortunately, but little aware of its circumstances and conditions, and seem to care even less for its particular problems. And yet, in proportion to the capital outlaid upon it, it is one of the most profitable of all our chemical industries, coal-tar colours not excepted.

Fuel economy, and the proper utilization of coal, whether in connection with manufacturing operations or domestic heating, will become one of the most important national questions during the trying years that will follow hard upon this war, because of all directions in which national economy can be most healthfully and advantageously exercised, this is perhaps the most obvious and prolific. For it is tolerably certain that, with an efficient and systematic public supervision of fuel consumptions, we ought to be able, even with existing appliances, to save many millions of pounds of our annual coal bill, and with improved appliances still more millions—a saving which would in the long run redeem a considerable amount of the war loan which has been much more easily raised than it will be repaid.

Now, I fear that not only are chemists for the most part lamentably ignorant of the nature of coal, and of modern fuel technology, but they have been for many years past so indifferent about such questions that they have been content to leave them almost entirely to engineers who, as a body, are notoriously deficient in chemical sense and experience. The engineer has indeed not usurped the place of the chemist, but has had to do his best to fill the position long since abdicated by the chemist.

This, indeed, seems strange when we remember that the foundations of Modern Chemistry were deeply laid by investigators who were, above all things, "fire-worshippers." But, judging from most chemical text-books, nearly all that the modern student of chemistry is taught in our academies about combustion was known to Lavoisier; and I question whether in the majority of our University laboratories any investigations on coal or combustion is ever undertaken. And yet the subject is full of most fascinating and fundamental theoretical problems—for the most part unsolved; and the nation consumes every week as much coal as could be exchanged for the whole quantity of aniline dyes used by its textile industries in a year.

Moreover, such advances as have been made during recent years, and they are by no means inconsiderable, have nearly all been in the direction of the wider applications of gaseous fuels. Yet in how many of our University laboratories is even gas analysis taught, or how many of our Schools of Chemistry provide systematic courses in the chemistry and manipulation of gases, without which no professional training of industrial chemists, however much "research work" it may include, ought to be considered satisfactory? It is my opinion that this important branch of our chemical craft and science has not, for many years past, been accorded its proper place and share of attention in the ordinary curriculum of the majority of our academic institutions.

Of the 189 million tons of coal consumed in the United Kingdom in the year 1913, about 40 million tons, or (say) approximately one-fifth of the whole, were carbonized either in gas-works, primarily for the manufacture of town's gas, or in coke-ovens for the manufacture of metallurgical coke—in practically equal proportions. Two-thirds of the latter was carbonized in bye-product recovery plants; the remainder in the old wasteful beehive ovens. So that, roughly speaking, we have—

Total Coal Carbonized = 40 Million Tons.

In Gas-Works.		In Bye-Product Coke-Ovens.		In Beehive Coke-Ovens.
20	..	13·5	..	6·5

At present there are 8297 bye-product coke-ovens built in this country, of which 6678 are fitted with benzol recovery arrangements, capable of producing something like 10 million tons of coke per annum.

The yields of the various bye-products obtainable on such coke-oven installations naturally vary with the locality and character of the coal seam; but they probably average somewhat as follows—expressed as percentages on dry coal carbonized:

District.	Ammonium Sulphate.	Tar.	Benzol and Toluol as Finished Products.
Durham	0·9 to 1·45	2·5 to 4·5	0·6 to 1·0
Yorkshire	1·3 to 1·5	3·5 to 5·0	0·9 to 1·1
Derbyshire	1·3 to 1·6	3·5 to 5·0	0·9 to 1·1
Scotland	1·4 to 1·6	3 5 to 5·0	0·9 to 1·1
South Wales . . .	0·9 to 1·1	2·0 to 3·5	0·6 to 0·75

Or, to put the matter a little differently, each ton of dry coal carbonized yields from 20 to 35 lbs. of ammonium sulphate, from 56 to 112 lbs. of tar, and from 2 to 3½ gallons of crude benzol, &c.—according to the locality. About 65 to 70 per cent. of the crude benzol is obtained as finished products—benzene, toluene, solvent and heavy naphthas.

How rapid has been the development of the bye-product coking industry in this country during recent years may be judged from the following official returns of the quantities of ammonium sulphate annually made by such plants, as compared with the corresponding quantities produced in gas-works.

Tons o Ammonium Sulphate Produced in

Year.	Bye-Product Coke-Oven Plants.		Gas-Works.
1903	17,435	..	149,489
1908	64,227	..	165,218
1913	133,816	..	182,180

In the natural course of events, the final disappearance of the wasteful beehive coking-oven from this country is now only a matter of a few years; but I venture to suggest that public interest would justify the Government fixing, by law, a reasonable time-limit beyond which no beehive coke-oven would be allowed to remain in operation, except by express sanction of the State, and then only on special circumstances being proved.

There is also much need of a better and more systematic chemical control, in the public interest, of bye-product coking plants. At present, in far too many cases, the chemists employed in coke-oven laboratories are men who have practically no chemical training other than that obtained in evening classes. And, with few exceptions, the chemist, however competent he may be, is entirely subordinated to the directing engineer, and regarded as a mere routine analyst. I can say, from personal knowledge, that plants which are managed and controlled by experienced chemists of broad training, combined with force of character, yield much better results than those which are controlled by men without such qualifications.

And even in this crisis when so much depends on plants working not only at their maximum output capacities but also, chemically speaking, under conditions calculated to ensure the highest yields of benzol and toluol—with a proper selection of coal, I doubt whether the measures which have been taken to advise and supervise the coke-oven industry are really adequate from the point of view of chemical control. I do know, for instance, that the experience and resources of the majority of our University Departments of Applied Chemistry which specialize on Fuel Technology and cognate matters have not been as fully utilized as they might have been in this connection. I cannot for one moment imagine a similar state of things being permitted in Germany, where we may be sure that nothing is being left undone in the way of fully utilizing all the available expert chemical and engineering knowledge which can be brought to bear on this important aspect of war munitions; and I venture to say that, whatever may be the case in this country, in Germany at least the staff and resources of no publicly maintained Department of Fuel Technology will not be fully employed on war problems.

The coal-gas industry, which deals with some 20 million tons of coal per annum, has, especially within recent years, shown a growing appreciation of the aid of chemical science, in regard not only to the actual manufacture but also to the domestic and industrial uses of coal gas. The endowment by the industry, in 1910, of a Special Chair at the Leeds University, in memory of the late Sir George Livesey (of which I had the honour and pleasure of being the first occupant) was a sure sign of the faith of its leaders in the value of scientific research into its special problems; and, from personal knowledge and intercourse with gas engineers, I can assure my chemical colleagues that any serious interest taken by scientific chemists in these problems, or in training men to tackle them, will be welcomed by the industry, no matter from what quarter such help or interest may come. For although the carbonization of coal in gas-works is efficiently carried out, no one in the industry supposes that finality has been reached, or that existing methods and conditions cannot be improved under better chemical control.

And, moreover, the gas industry has just recently given a striking example of the public benefit which may accrue from the whole-hearted co-operation of the chemist and engineer in the new nickel-catalytic process for the removal of carbon bisulphide from coal gas, which has been worked out, and brought to a successful issue, by the combined skill and efforts of Mr. Charles Carpenter, D.Sc., Mr. W. Doig Gibb, and Mr. E. V. Evans, of the South Metropolitan Gas Company. They have shown that the sulphur content (as CS_2) of London coal gas can be reduced on a large scale, in regular day to day working, from nearly 40 to about 8 grains per 100 cubic feet, without in any way deteriorating the quality of the gas, at a cost (including interest and depreciation) of 0·299d. per 1000 cubic feet. Such a striking success was, as Mr. Carpenter acknowledges, only achieved "because of the unrestricted and unreserved collaboration of the chemist and the engineer." Incidently the gas industry is to be congratulated on this tacit abandonment of the old contention that coal gas was either none the worse for the presence in it of a certain amount of sulphur compound or (alternatively), if worse, that a minute amount of sulphur dioxide in the atmosphere of a living room is so rapidly absorbed by the ceiling that its harmful effects are nullified.

As the outcome largely of the work of the Joint Committee appointed in 1907 by the Institution of Gas Engineers and the University of Leeds (of which I was a member) to investigate gas-fire problems, the manufacturers of these appliances have paid much more attention than formerly to the scientific aspects of construction, so far as to ensure the best combination of radiant and ventilating effects; and nearly all the larger firms have now their scientific staffs busily employed in making further advances. Prominent among the pioneers in scientific gas-fire construction has been Mr. H. James Yates, who will to-morrow enlighten you as to some of the most recent improvements. I can, however, from personal knowledge, testify to the enterprise shown by most of the leading manufacturers, and that their combined efforts have resulted in a very efficient and perfectly hygienic domestic gas-fire. A Committee appointed by the Institution of Gas Engineers, upon which scientific men are largely represented, is now considering the adoption of a standard method of testing the radiant efficiencies of gas-fires. Thus no one can say that the gas industry is not making every effort to put its affairs upon a thoroughly scientific basis.

Passing on to the metallurgical and allied industries (who, of course, are large consumers of fuel), there is much here to be done in improving the construction and operation of furnaces in order to check the waste of fuel. But of these details there is no time to treat; and one instance of the possibilities of very large economies as the result of scientific control must suffice.

It is perhaps common knowledge that the most economical arrangement of plant for the manufacture of iron and steel is one in which bye-product coke-ovens, blast-furnaces, steel furnaces, and rolling mills are brought together on one site and under one organizing direction; so that the surplus gases from the coke-ovens and blast-furnaces may be utilized to the fullest extent. My relative, Mr. T. C. Hutchinson, of the Skinningrove Iron Company, who has devoted many years of anxious thought and practical study to this important problem, ventured some few years ago to predict that—with the most approved type and arrangement of plant, working under strict scientific control by competent chemists—it would soon be possible to make finished steel rails or girders from Cleveland ironstone with no further consumption of coal than is charged into the bye-product coke-ovens for the production of the coke required for the blast-furnace; and all subsequent experience at Skinningrove has fully demonstrated that his prophecy can be fulfilled in everyday practice. Of course, it means a constant watchful control by a well-paid and competent scientific staff under efficient leadership; and in Mr. E. Bury—an old Owen College student, trained in an atmosphere of "gas and combustion"—we have found the very man for the work.

It is perhaps unnecessary, even had time permitted, for me to multiply instances of possible economies in other important directions—such, for instance, as power production and the heating of domestic apartments. There is probably no direction in which equally good results would not accrue with proper scientific application and control as those already cited as having been reached in the direction of carbonization, or in the iron and steel industry. To-morrow we are to discuss the important subject of smoke prevention, in which many Manchester public men are showing an active interest; so that there will be some further opportunity of referring to the matter.

But may I, in conclusion, appeal in all seriousness to chemists and scientific men generally to take up this important matter effectively as a public duty at this crisis in the country's affairs. I would suggest that the Government be memorialized with a view to the establishment of a central organization for the supervision of fuel consumption and the utilization of coal somewhat on the lines of the existing alkali works inspection, which has been so beneficial to chemical industry. And in connection with such an organization there might be undertaken a much-needed systematic chemical survey of British coalfields, as well as experimental trial of new inventions for fuel economies. There would certainly be no lack of important work for such a properly-organized department of the State; and there can be no doubt at all that the results of its activities would be not only a very large direct saving in our colossal annual coal bill, but also a purer atmosphere and healthier conditions generally in all our large industrial areas.

Gas-Flame as a Metal Colouring Medium.

According to "Metal Industry" [quoted by the "Ironmonger"], what is known as the French grey or smoke finish on aluminium is produced by the aid of gas-flame. The method is to lacquer the articles with a gum lacquer or a lacquer that contains a fair percentage of gum, so that under the influence of reheating the lacquer becomes resilient. After the lacquer is applied and becomes cool, the articles are handled with suitable frames made from iron wire, used from the inside when possible—a plan which obviates the risk of finger-marks caused by the softening of the lacquer. A permanent gas-flame should then be arranged, with a protection from draughts by a glass or wooden frame extending on each side and at the rear of the flame. The flame should not be too strong; the idea being to produce a flame that will yield as much smoke as possible. The lacquered articles are manipulated over the flame in such a way that anything from a mere shading to an intense black colour is produced at the discretion of the operator. After the smoke-black result is obtained the articles are allowed to cool, and should then be wiped with boiled linseed oil or immersed in a warm bath of the oil. This gives a lustre to the smoke-black impregnated in the lacquer without affecting or reducing it.

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The Last of Fishtail Burners in Berlin.—Last week's "Ironmonger, in a page of "German News," states that the Berlin Municipal Gas-Works and the English Gas Company of the same city [the Imperial Continental Gas Association] announce that from the middle of September the constitution of the coal-gas supplied will be so altered that it will be impossible to use fishtail burners. As there are still a number of such burners in use in some of the poorer quarters, house-owners are warned to replace them in time with incandescent mantles.

Safety of Gas Lighting.—The "American Gaslight Journal" for Aug. 23, wrote: The comparatively safety of gas is well illustrated by figures taken from the report of the Fire Insurance Commission of Texas, dated April 19 last, covering particulars of 49,000 fires occurring in the State since Dec. 10, 1910, as reported to the State Fire Marshal. The statistics show with marked effect, the reliabilty of gas in the household, as contrasted with other sources of light and fuel. The number of fires reported Dec. 19, 1910, to April 19, 1915: Traceable to gas, 908; to electric current, 2447; to gasolene and kerosene, 2492. The number of fires caused by coal and wood stoves were: From stoves, 2749; from flues, 3996; from ashes, 940. Coal and wood stoves, with their attendent flues and resulting ashes, have been responsible in about four-and-a-half years for 7685 fires, or eight-and-a-half times as many fires as were chargeable to gas in the same period.

DISCUSSIONS AT THE NORTH BRITISH ASSOCIATION MEETING.

In last Tuesday's "Journal" there were published the four papers read at the recent annual meeting in Edinburgh of the North British Association of Gas Managers, together with the discussions on two of them. The shortness of the time at disposal before going to press compelled the holding over of the reports of the remaining two discussions; and these are given to-day. They are on the paper by Mr. R. W. Cowie, of Dalkeith, entitled the "Training and Education of Gas-Fitters," and that by Mr. William Gordon, of Edinburgh, on "Gas Measurement: Past, Present, and Future."

GAS MEASUREMENT: PAST, PRESENT, AND FUTURE.

[See *ante*, p. 515.]

The President (Mr. J. B. Scott, of Cowdenbeath), in opening the discussion, said he felt this was a paper which it would be profitable to them to read many times over. It was interesting to learn that, in the early days of gas making, men were anxiously trying to discover some fair and equitable method of measuring gas. It was all the more creditable to the pioneers in this direction to find that, in certain appliances, few alterations of a material character had been made down to the present day. The correct measurement of gas was undoubtedly a subject of considerable importance to them all; and he believed when Mr. Gordon's paper was published, it would stimulate and encourage a belief among the consumers that, after all, their interests were being pretty well looked after. They would be encouraged to realize that in these times they were buying their gas fairly, and that the instrument which registered the consumption was, to all intents and purposes, as perfect as human skill and ingenuity could render it. In the course of his paper, Mr. Gordon made an interesting comment to the effect that gas was the only illuminant supplied to consumers through instruments which were officially tested for accuracy under conditions as prescribed by Act of Parliament, and that so much as this could not be said for the rival illuminant. The day, however, might come when those identified with the rival movement would find a meter that would prove to be equally as accurate as the gas-meter; and after all he did not think that this would really be a bad thing for the gas industry. In his opinion, if the majority of people had to pay for all the electricity they actually used, their accounts would be very much higher than they were now. Personally, he knew some instances where the consumers could use a certain amount of current, and yet the meter never turned a wheel in registering it. It was only when the consumption reached a particular standard that the meter began to register at all. He did not think they could say that of the gas-meter.

Mr. Alex. Wilson (Glasgow) said the paper furnished an interesting historical record of what had taken place in connection with gas measurement, and it testified to the standard of accuracy to which the meter had been brought by manufacturers. It was wonderful to note the results disclosed in one of the tables accompanying the paper—namely, that, although the pressure varied from 0·5 inch to 4 inches, the result all over was the same. There was something about this that he did not quite like; it was, he thought, just too strikingly accurate. When the pressure was increased to such an extent as 4 inches, there ought surely to be a variation in the result. The figures which were given should certainly ease the public mind. When disputes arose as to the accuracy of meter-reading, it would be well worth while to have a copy of Mr. Gordon's paper handy, because it seemed to him (Mr. Wilson) that a definite pronouncement on the subject from an authority like Mr. Gordon ought to carry some weight.

Mr. S. B. Langlands (Glasgow) said that, as official meter-tester in the City of Glasgow, he felt it would be wrong on his part not to rise and thank Mr. Gordon for the clever paper he had given to the Association. It was a paper in which there was a grain of humour as well as an accurate and careful review of all that had transpired since the early days of gas recording. The Sale of Gas Act was one of those almost perfect Acts of Parliament framed as it was, first, in 1859 and very slightly altered in 1860 and 1864. To-day the only divergence from the original condition of working was that the test was to be carried out at 0·5 cubic foot when the normal conditions of working were 3 inches pressure. If they turned to the text of the paper it would be seen that in a series of tests where the pressure ranged from 0·5 inch to 4 inches there was actually no variation in the result recorded by the meter. For his own part, he (the speaker) would prefer to see the Act more in conformity with present conditions of working. He did not know that he would go the length of changing the ½ inch pressure test, but thought there should be a second test at normal pressure, which would be a satisfactory verification of the first test. Proceeding, he (Mr. Langlands) said that he had been particularly interested in Mr. Gordon's remarks about a high-pressure meter test. Just now there was no high pressure meter on the market which could be called a meter, in the sense that a meter of the lower-pressure type was a meter. It was true there were many appliances on the market which went by the name of high-pressure meters; but he doubted if there could be the same accuracy. Indeed, he made bold to say that there was not. There was plenty of room for the inventive genius of gas engineers to bring a perfect instrument on to the market. The author, it would be noticed, put forward a plea for the standardizing of high-pressure meters, and he quite agreed with his observations in this connection, though he would rather prefer that the meter should meet the variations of pressure than that the pressure should be kept equal throughout. Personally, he might explain that he was going forward this year to obtain the power that the London County Council secured for testing high-pressure meters; and he was doing so in the hope that a perfect system of measurement would be evolved. By-and-bye he hoped that Mr. Gordon would see his way to complete his history of the whole question from the early days down to the present time. If the author did this in the same lucid and informative way as he had prepared the present paper, they would then have a record of very great value indeed.

Mr. Alex. Yuill (Dundee) said he, like Mr. Wilson, felt that the paper was most instructive. In a sense it was partly historical and partly descriptive of the work in which the author was engaged. While the figures that were referred to by the last speaker were rather surprising, still the results were nothing more than they might expect from a meter manufactured by a firm on whom they could place entire dependence. There was one point he must mention, which was that the continued registration at 1·01 per cent. for pressures varying from 0·5 inch to 4 inches was not quite what he would have expected. At the same time he was quite willing to take the figures as Mr. Gordon had given them. There was one other point on which the author might give them further information. He (Mr. Yuill) presumed the 4-inch pressure was the pressure at the inlet of the meter; and if they maintained a pressure of 4 inches to the outlet of the meter, they were measuring a cubic foot. A cubic foot of a gas, even supposing it differed in specific gravity, was still a cubic foot of the gas being dealt with. The point he would like to know was this, What was the pressure at the point of ignition? If the pressure at the point of ignition was 4 inches, then this bore out the accuracy of the meter. Dealing with the other table in the paper, where there was recorded the consumption per hour at varying pressures, another very interesting question arose. Hitherto they had been under the impression that, if they doubled the pressure, they would increase the volume by 50 per cent. He found from the table, however, that by increasing the pressure from 0·5 inch to 1 inch, the consumption per hour increased from 30 per cent. to 43 per cent.; while an increase of pressure from 2·5 inches to 3 inches showed merely an advance of under 10 per cent. in the consumption per hour. In his paper the author had made reference to uniform pressure and the standardizing of high-pressure meters. It seemed to him (Mr. Yuill) that it was essential for them as gas engineers ever to keep before them the necessity of giving what was termed a "uniform pressure" to the consumers at all times. This could only be done by having an unusual pressure in the mains, and so be in a position to supply it to the consumers when and if required. They would need to have the pressure governed at the consumers' meters so as to give the uniform pressure at the point of ignition.

Mr. William Wilson (Falkirk) remarked that the paper had fallen like a meteor among them, because of late they had heard so much of vertical retorts *versus* horizontal retorts that it was quite refreshing to get back again to the Sale of Gas Act. Like Mr. Yuill, he had been struck with some of the figures in the paper; and his colleague from Dundee had forestalled him with the very question he had intended to ask. He really, however, did not think Mr. Gordon had gone far enough with his first table, because the consistency and accuracy there depicted were always what he (Mr. Wilson) imagined would take place on a restricted output. If Mr. Gordon would tell them whether a cubic foot of gas at 4 inches pressure (passed out of one holder into another) would occupy at the end 1 cubic foot, that would set their minds at rest as to the actual accuracy of their meters at varying pressures. The second set of figures was, he thought, really more astonishing than the first; but he could not challenge them because he believed they were, in all probability, most accurate. It was surprising to notice that the meter registered exactly the same result above the first ½ inch of pressure—between 1 inch and 3 inches—notwithstanding the enormously increased volume of gas which was being passed. Mr. Yuill was quite correct, in a sense, in saying that, when the pressure was doubled, the volume was increased by one-half; but he (Mr. Wilson) thought there was another factor to be taken into consideration here. This was the friction of the meter, and the rapidity of the movement connected with it. There was bound to be, as a result, a more retarding effect. He was very glad indeed that Mr. Gordon had refreshed their memories on the point that electrical meters were not perfect. It was a point which he (the speaker) raised with considerable effect in his own town when they were booming high-pressure gas against electric lighting. His Town Council decided that they would test the two illuminants for themselves; and he (Mr. Wilson) explained to them that he was quite prepared to carry out the test in opposition to the Electricity Department if the Town Council undertook to see fair play. He asked that the Town Council should insist on the Electricity Department putting in electric meters which had been duly sealed and attested by the Board of Trade. It was unnecessary for him to add that the Electricity Department could not produce the meter.

Mr. Samuel Milne (Aberdeen) said it was some years now since he was associated with the testing of gas-meters; but he could recall that there were at the time certain fixed notions in his mind. One of these notions was that, if they overdrove the meter, there was a tendency for it to go slow; while if it was underdriven there was an aptness on its part to go fast. He was agreeably surprised to notice one of the tables given by Mr. Gordon, and had also observed some later remark—viz., "The volume of gas varies very considerably under compression," &c. It had been a most interesting experience indeed to have had this historical review of gas-meters and gas measurement; and it would appear as if they had reached perfection even as far back as 1859, when the Sale of Gas Act was passed. It had often appeared to him that the provisions of the Sale of Gas Act were not quite satisfactory on one notable point. Why, for example, should they be called upon to test at ½-inch pressure, and restrict the amount of gas passing through the meter when, as someone had remarked in the course of the discussion, the normal pressure was something approaching 3 inches? If it was a five-light gas-meter they did not know whether it would be required to deal with 30 or 60 cubic feet of gas per hour. In one of the tables in the paper it would be seen that, at 3 inches pressure, there was a consumption per hour of 75 cubic feet, and 30 cubic feet at a pressure of 0·5 inch. He was not aware there was such an extraordinary range in the delivering capacity of a five-light dry gas-meter; and he was wondering if there was anything special about the meter which had been so tested by Mr. Gordon. He (Mr. Milne) was hopeful that they might have had from Mr. Gordon some of his experiences in the testing of old meters. Personally, he knew of one meter inspector who had received a meter from an outside complainer, and on testing it he found it was wrong. Before issuing his certificate he tested it again and found it right; a subsequent test showed it to be once more wrong; and as the outcome of much testing and retesting he could not in reality say in what condition it stood. He (Mr. Milne) could not say whether or not the inspector finally condemned the meter. If the author could narrate some of his experiences in this direction, they would certainly prove most interesting.

Mr. J. W. Napier (Alloa) said there was no doubt suppliers of electricity were at a disadvantage, compared with gas engineers, in regard to meters. The trouble came to be in cases where a large meter was installed, and the consumer used only a single light. In such a case it was quite true that the electricity department suffered very serious loss; and it was to the advantage of the electricity departments to exercise great care in seeing that the meters fixed for consumers—more especially lighting consumers—were not too big. He had found it necessary in Alloa to change all electricity meters in the establishments of the largest lighting consumers, simply because, in almost every instance, it was found there was a loss in consumption. The lessened consumption of energy in a more efficient lamp did not prove sufficient to make the meter work and record satisfactorily. At the same time, he believed that the electricity meter, for all practical purposes, was quite a satisfactory measuring instrument; and neither the consumer nor the electricity department had much to complain of at present. He was not at all surprised at the results obtained by the author of the paper, all of which went to prove that the accuracy of the gas-meter was maintained whether the pressure was ½ inch or 4 inches. He thought it would have been of the greatest interest to the practical gas engineer to have heard from the author what degree of error entered into the meters that were passing a greater volume of gas than was stipulated for. They recognized that the two-light meter had got out of date; and this size was not sufficient when regard was paid to the number of gas-cookers and gas-fires that were to be found. On the other hand, having regard to the large capital expenditure which was involved in the purchase of meters, they naturally were somewhat reluctant to change to the larger sizes. It would be exceedingly valuable information if the author could tell them whether the range of error was considerable in the ordinary sizes of meters which were working beyond their rated capacity.

Mr. Gordon, replying to the discussion, said when writing the paper he had in view the desirability of allowing laymen or the consumers to grasp certain facts from it. He preferred that it should serve this useful purpose rather than for it to bristle with technicalities. He was glad the paper had given rise to a discussion, because after all a paper was hardly worth writing unless there was a little difference of opinion about it. Regarding the remarks made by Mr. Wilson, of Glasgow, he might say that it was the somewhat extraordinary result recorded by the meter in question that caused him to give it prominence in the paper. He might mention that the President of the Association only allowed him a mere matter of a couple of days in which to prepare the paper; and as a consequence he had to get together some old data. He came across in a letter book the figures he had given; and he thought they were well worthy of being reproduced. In the table referred to by several of the speakers, one interesting feature would be observed—that, while multiplying the pressure by four, they were doubling the consumption. This had generally been his experience in testing gas-meters. A suggestion had been made by Mr. Langlands that the indices should be stamped; but the unfortunate thing was that what would be a three-light meter with one maker would not be regarded as a three-light meter by another. It seemed to him (Mr. Gordon) that the elucidation of the whole problem was to be found in the standardization of the maximum. So far as the question put by Mr. Wilson, of Falkirk, was concerned, he would remark that it was impossible to pass the pressure from one holder to another. There must be an atmospheric pressure to enable the carrying to be done from one holder to another; and unless there was a necessary weight put on to transfer the gas from one holder to another, it would be stationary. In regard to compression, he thought that the difference between ½ inch and 4 inches was so small that it must have little effect on the volume. The difference would in all probability be most apparent when the highest pressure was reached. The London County Council, as was well known, had to some extent anticipated them all by getting powers from the Legislature to test meters under high pressure. Now that they had such permission, they would require to go ahead and devise an instrument to give effect to the powers which they possessed. Frankly, he was hopeful that, in course of time, these same powers would be made applicable throughout the whole of Great Britain. As an official under the Sale of Gas Act, he was only allowed to test in terms of the Act. It could only be as an official of the municipality he could give his experience as to old meters.

TRAINING AND EDUCATION OF GAS-FITTERS.

[See *ante*, p. 518.]

The President (Mr. J. B. Scott, of Cowdenbeath), in opening the discussion, remarked that there were few gas managers nowadays who had not one or two gas-fitters in their employment; and they would agree with him in saying that the chief difficulty experienced was in making a proper observation of the work done by these men. The fitters left the works with a certain amount of work to perform; yet when they entered the homes of consumers they were left, as it were, pretty much to the freedom of their own will. It was almost impossible—even in a city where there was a large staff of inspectors—to keep a careful watch over the work done by the fitters; and the difficulty was accentuated in the smaller towns, where, as a rule, the manager had generally enough to get through without chasing these fellows, to see whether or not they were making a good job. There was no doubt that the efficient education of the gas-fitter was an important solution of an interesting problem. If they were to have any ease of mind at all, and were desirous of doing their best for the consumers, they must adopt some system of educating the gas-fitter, so that he would become an individual of knowledge and sense. They wanted him to become possessed of sufficient good sense to realize that he was sent among the consumers largely on his own responsibility, and, on this account, was expected to make a thoroughly satisfactory job of everything he took in hand.

Mr. Ralph Halkett (Glasgow) said that in large towns facilities in regard to education were open to most of the gas-fitters; and in this respect they enjoyed a considerable advantage over their colleagues in smaller towns. His feeling, however, was that the fitters did not take advantage that they ought to do, even in the larger centres, of the facilities and classes; and it was for gas engineers to impress upon them the benefits derivable from such a course of education. In the smaller towns the difficulty, he admitted, was not easy to overcome; for the simple reason that the fitters had not the same facilities in relation to classes and teachers. To his mind, however, the difficulty could be got over if there was at different centres a recognized teacher to whom all fitters within a radius of from 12 to 15 miles could go. He believed a plan on similar lines to this had been inaugurated by the Manchester District Gas Institution, and they were hoping that in the coming winter it might be attended with great success. In the course of his paper, Mr. Cowie had also dealt with the scheme set in operation by the Edinburgh and Leith Gas Commissioners for the education and training of gas-fitters. There was no doubt this was a very valuable scheme, and one from which apprentices should in the future greatly benefit. It was felt now as a real necessity that the gas-fitters of to-day should be educated in regard to the problems and difficulties which were being met with in the gas profession; and it was with this object in view that the Institution of Gas Engineers co-operated with the City and Guilds of London in arranging for examinations. The first examination, as most of them knew, took place this year; and they could say with regard to it that it had been, on the whole, very satisfactory. In the final grade he believed 48 sat; and the other figures were: Grade II., 76; and Grade III., 136. In this connection, he should like to say he did not think Scotland was as far advanced as it really ought to have been. He believed Glasgow was the only centre to put forward candidates for the examination. This was not what it should be; and he hoped means would be taken to ensure that Scotland had a few more candidates at next year's examination. He was glad to note that the Institution had rightly adopted the idea of giving certificates to those gas-fitters who were really competent men—men who did not feel disposed to sit, or were not able to take an examination, but who, from the point of view of the gas industry, were quite capable members of the staff. The Institution had very rightly considered that such men as these might be put to a great disadvantage if they were asked to compete alongside their younger colleagues; and so, up to 1916—provided the application form was completely and satisfactorily filled up—certificates would be granted. The possessors of these certificates ought not in the future to be allowed to lie dormant. There might be a disposition among them to think, now that they were fully qualified, they could drop their attendance at the classes; but care should be taken to guard against this. To overcome the difficulty, he would suggest that periodical lectures should be given to the men in the various departments, with the view of brushing them up a little, and not permitting them to forget what they had learned. He should like now to refer to one sentence in Mr. Cowie's paper which required a personal explanation—viz., "As Mr. Halkett pointed out in his report on the examination in Glasgow, this inability to express themselves in words was one of the weakest points." Speaking of the examination in general, he (Mr. Halkett) might say he was not aware who the individual candidates were when marking the papers.

Mr. David Vass (Perth) said the war had upset all their calculations considerably; and any attempt to organize classes in certain districts had failed on this account. He thought, however, this was a question which ought to be kept very prominently before them, so that in the future they would have classes, not only in Glasgow, but also in Edinburgh, Dundee, Aberdeen, and many of the other large centres. It would be recalled that, in his (Mr. Vass's) Presidential Address last year, he dealt a little with the apprenticeship question; and he was still disposed to think a solution of the difficulty would be found in a scheme for the training of apprentices in the large cities. In this way, qualified men would be found for the smaller towns. Prior to his appointment as gas engineer in the city of Perth, an attempt had been made to train lads; but the idea had only been developed in a haphazard way. When, however, he took over the duties in Perth, he tried to extend the knowledge of the lads by giving them a training in, and passing them through, the various branches. Up to this time, the lads were only assistants to the men. Their work embraced little more than merely carrying tools; and in no way whatever were they receiving practical insight into their business. He arranged that each apprentice was to have a spell of training in the repairing shop, so that he might learn all about the apparatus and its different parts. This was followed by a course of training in the meter-shop, when opportunities were afforded the apprentices of observing and assisting in the repair of meters. It was further arranged that some little time should be spent by the lads in the stores department; and in this way they became accustomed to the handling of material which was to go out to the different jobs. In Perth, they had experienced one difficulty. It was a bit of a stumbling-block, because it had emanated from the tradesmen who were plumbers. The latter objected that the training the apprentices were receiving did not fit them to become either plumbers or gas-fitters, and that, in point of fact, they would be little more than half plumbers and half gas-fitters. Of course, he (Mr. Vass) did not wish to have the apprentices trained altogether as plumbers; but his desire was to have them made thoroughly competent as gas-fitters who possessed sound practical knowledge of gas appliances. One difficulty which they experienced, further, was that the lads could not join the Plumbers' Association; while there was no gas-fitters' union in Perth; and, of course, it could not be claimed that the apprentices were tinsmiths. This was the attitude the trades union had adopted; but it seemed to him they must look to the gas-fitting apprentices themselves to get over the difficulty, and have gas-fitting recognized as a separate and distinct trade. There was quite sufficient scope in the gas profession for the training of men to have a special knowledge of gas appliances, independent of the plumbing or tinsmith trades. Unquestionably, this was one of the points they would have to stand up and fight for—namely, to have gas-fitting recognized as a trade by itself. The paper Mr. Cowie had read teemed with most interesting suggestions; and he had the feeling that it would prove useful and helpful. At first, he had experienced some difficulty in getting the men to subscribe for a weekly copy of "Gas: Light, Distribution, Maintenance;" but this had now been overcome. Apprentices were given copies of the paper free of cost, with a view to keeping them in touch with their work. He was hopeful that, when the apprentices returned from the war, they would continue their studies and training with the same enthsiasm as in the old days.

Mr. Alexander Masterton (Edinburgh) observed that Mr. Cowie had given a lucid outline of the scheme for training gas-fitters which was being carried out in Edinburgh. He might add that the scheme had proved to be quite an effective one; and up to the outbreak of the war they were getting around them a good set of tradesmen, who were taking an intelligent interest in their work, and doing all they could to make themselves efficient gas-fitters. Then, again, the Gas Commissioners, in order to further encourage the apprentices, guaranteed at the beginning of each session the refunding of fees; and at the close of the course only those lads who had not behaved, or who had failed to reach a sufficiently high standard of merit, did not receive their class fees. After serving their apprenticeship, the lads were put into the meter-reading department. In this way they came in close contact and actual touch with the consumers; and being conversant with the practical side of the business, they were able to discuss intelligently with the consumers propositions for the expansion of the gas supply. Further, these men could be sent out to investigate complaints; and they were quite capable of preparing a practical report on what was required. With regard to the Institution's scheme for the certification and registration of gas-fitters, the one aim of the Institution was that those men who, through no fault of their own, had got beyond the age when they could reasonably be expected to study and prepare for examinations, should not be debarred from the advantages of certification and registration. This to his mind was quite a reasonable claim on behalf of a body of men who were intelligent, trustworthy, and capable workmen. Though this examination scheme threw a considerable onus and responsibility upon gas engineers, he personally thought no one would grudge that, if it was going to be for the benefit of the industry. No doubt it was difficult to forecast how the scheme would develop, or what the results would be; but, at any rate, it was worthy of their whole-hearted support, and they should do what they could to give it a fair trial.

Mr. C. P. Myers (Troon) said the author was to be congratulated on bringing under their notice a subject well worthy of attention. The consideration which the scheme had received in the course of the discussion had so far been from the standpoint of the larger towns of Scotland; but in anything he had to say, he would approach the subject rather from the view-point of the villages and smaller towns throughout the country. At more than one meeting of the North British Association, he had felt somewhat depressed that the trend of the discussions had been to bring forward points for the consideration of gas engineers in Perth, Dundee, Aberdeen, Glasgow, and Edinburgh. It seemed to be forgotten that much of the gas manufactured in the country was made outside these royal burghs and populous areas. It appeared to him that, however true to the situation the scheme outlined by Mr. Cowie might be, however well it might fit in with the needs of the places he had already named, Mr. Masterton had let out the real secret. That gentleman had clearly indicated in the course of his speech that it was chiefly for the supply of meter inspectors that this scheme had been launched. Consequently, he (Mr. Myers) did not think the method which had been outlined would at all suit the smaller towns. In his county—Ayrshire—probably the largest employers of gas-fitters and plumbers were the Glasgow and South-Western Railway Company and Nobel's Explosives Company, at Ardeer. The experience of both these large corporations had gone to show that they could get the best men from the small workshops of private traders. The proposed new departure which had been outlined for them was quite in the line of modern teaching—the elimination of the private trader. It aimed at getting the work done by the corporation direct; but, to his way of thinking, it was in the interests only of the gas appliance makers and the metal merchants. The lads who were trained under the conditions sketched out would not work so economically as they would do for the small private trader on contract jobs. Lads who were brought up under a private trader were taught the principles of economy—the all-important question of economizing material and labour. He took it that in working for corporations the old phrase would still prevail: "It is a good strong concern, and there is no need to economize." It was all very well to specialize; but their business he thought hardly offered sufficient scope for the training of young men. The mere laying of a service-pipe and the connecting-up of a meter constituted altogether too-limited a scope for training young men. Specializing was all very good for those who were old and bald-headed; but they would really require to offer something more to young men in the way of training than merely the work of laying service-pipes and fixing meters. He was one of those who still thought that they should endeavour to encourage private traders to train young men.

Mr. George Bruce (Tayport) said he was distinctly of the opinion that, if gas-fitters were a little better paid, it would go a long way towards a more easy solution of the gas-fitting problem. Personally, he deplored the tendency which prevailed, especially in the larger gas-works of the country, to employ cheap men. There was no question that many gas managers considered it an advantage to engage someone who had been trained as a plumber with a private individual. In adopting this course, they had the feeling that they were securing a better type of workman. To his mind, it would be an infinitely better arrangement if the large gas companies and corporations would get lads from private individuals—journeymen whose period of apprenticeship was over—and then train them for the class of work required in the gas industry. Young men who were taken on in this manner were more eager to push their way in the world, and more desirous of getting to the goal which they wished to reach. If the gas companies could only be prevailed upon to pay the standard rate of wages to their gas-fitters, they would assuredly discover a superior class of workmen. As things now were—due largely to the small wages paid—they got a poorer type of tradesman. Frankly, he had been astonished to find that some gas companies and managers expected to secure a qualified gas engineer and fitter for something like 25s. a week. The managers themselves ought to see to it that the fitters received the standard rate of wages; and if this were done, they would speedily find men capable of fixing a gas-fire, installing a geyser, and doing many other jobs. He had considerable sympathy with Mr. Cowie's claims for the more efficient training of gas-fitters; and he thought gas companies and corporations ought to see that this class of workman secured better treatment as a rule.

Mr. F. W. Goodenough (London), who was invited to join in the discussion by the President, said he had no qualification which justified him in taking part in the debate, since he was neither the manager of a large nor a small gas-works in Scotland. Perhaps, however, some excuse for the invitation which had been extended to him might be found in his connection with the Metropolitan gas industry. He was very glad to have an opportunity of associating himself with the complimentary references which had been made to Mr. Cowie's paper. As they were probably aware, this was a subject in which he was very much interested, although he did not think that he had anything particularly new or striking to say in regard to it on the present occasion. The author had ventured the observation that possibly some would think too much attention was being paid to gas-fitters. So far as he was concerned, he did not think it was possible to devote too much attention to the training and education of these fitters. During the last century, those associated with the gas industry had exercised themselves in the protection and perfection of machinery and the article produced by the machinery. What they had to do now was to correspondingly perfect and protect those who had the handling of the machinery, and who also took a leading part in the public service which the gas industry rendered. If the business of gas inspection was considered to end at the meter, then this subject would have little value for them; but, in view of the fact that their business did not finish until the consumer was satisfied, and until they had induced the consumer to use as much gas as he possibly could do, the question of the training of the men to whom was assigned the duty of fixing and maintaining the apparatus became one of prime importance. Mr. Myers had put forward a strong plea for the private trader, and had contended that apprentices brought up under a private trader learned more about the principles of economy than they did in the large company or corporation gas-works. It was just because the private trader practised so much economy, both in material and labour, in fixing-up an installation in which he had no further interest after he had been paid for it, that he (Mr. Goodenough) strongly advocated that much of this work should be done by the gas undertaking, and done in such a way as to make it a source of everlasting satisfaction to the consumer. He was fully in agreement with Mr. Cowie in the remark he had made in the paper, that gas-fitting embraced such a wide field of work and science that it could well stand alone as a distinct trade. Indeed, he sincerely hoped this would be the trend of development in the near future. They wanted to train men who could not only run a service-pipe and connect a meter, but who could fix a gas-fire so as to give satisfaction, instal a good water-heater, and fix-up a furnace for any reasonable purpose in such a way as to do credit to the gas industry. Once these appliances had been installed, then the satisfactory supervision and maintenance of them followed as a matter of course. Altogether, he was firmly of opinion that the gas-fitting trade offered to an intelligent young man plenty of scope for the exercise of his brains and mechanical ingenuity. He hoped that the presentation of this interesting paper would carry further forward the good work that was already on hand.

Mr. R. W. Cowie, in reply, said he was gratified at the discussion which his paper had evoked. After all, it seemed to him better that a manager from one of the comparatively small towns should introduce a subject of this kind occasionally, because it helped to get the views of other managers who were in charge of similar works. He was specially indebted to Mr. Halkett for the observations he had made; and he quite agreed with him that possibly much good could be done by the appointment of a travelling teacher. He did not think manufacturers' representatives, if they desired to give demonstrations, should confine them solely to the large centres and towns. No doubt, bigger orders were to be obtained there; but occasional visits to, and lectures in, the smaller towns would likewise prove helpful. To these demonstrations and lectures the local plumbers could also be invited. A remark was made by Mr. Halkett that Glasgow was the only centre from which candidates in Scotland went forward to the last examination. He rather thought the reason for this was to be found in the fact that the gas-fitters in Glasgow had been kept well informed of the approach of the examination. Perhaps if the fitters in the other works centres were similarly informed in the future, it might be possible to have examinations held in the other places which Mr. Myers had mentioned. He certainly agreed with Mr. Vass that there was sufficient work and variety in gas-fitting to have it distinguished as a separate trade from that of the plumbers. Indeed, in his view, no gas-fitter could be classified as being thoroughly competent until he was able to fit up a complete hot-water service in any house or building. Frankly, he did not see why this work should be regarded as the special preserve of the plumbers. Their own gas-fitter at Dalkeith served his apprenticeship with a practical plumber; and when he came to them he was quite astonished that he had so much to learn in the way of connecting-up gas-heating apparatus. He much appreciated the remarks made by Mr. Goodenough, and hoped that the movement which had been inaugurated by the Institution would result in an earnest effort on the part of gas-fitters to increase their knowledge during the coming winter. He quite admitted that the results in work of this kind could not be seen immediately; and it would probably be a year or two yet ere they realized the full effect of the effort which had been put forth on behalf of the fitters. In districts and communities where the gas companies and corporations supplied all sorts and varieties of apparatus, it was only reasonable to expect that the fitters would thoroughly understand the appliances.

MR. YATES ON GAS HEATING AND SMOKE PREVENTION.

In the course of the debate on "Smoke Prevention," at last week's meeting of the British Association at Manchester [*ante*, p. 571], Mr. H. James Yates, of Birmingham, made some extended remarks on the subject which justify reproduction apart from our general report of the proceedings.

Mr. Yates said that, in considering the question of air pollution and smoke prevention, two main elements are generally recognized—viz., smoke from domestic fires, and also smoke and deleterious gases from industrial establishments. As regards smoke emanation from both of these sources, he said he was a whole-hearted advocate of the view that it is to the use of gas in place of solid fuel that we must look for the solution of the smoke problem.

Referring to the industrial aspect of the question, he said his own association with the replacement of many solid-fuel furnaces by gas-fired furnaces had led him to the conviction that—apart altogether from the invaluable service of these latter in connection with the present enormous output of munitions—not the least among their practical advantages was the part they are destined to play as a factor in the reduction of smoke emanation in great manufacturing establishments, and correspondingly reducing the great waste of valuable bye-products which such smoke emanation involves. He did not, however, propose to deal in detail with this aspect of air-pollution and its cure, nor did he delay to inquire whether industrial or domestic smoke emanation was responsible for the greater harm. It was his present purpose to deal more particularly with the domestic aspect of the subject; and he hoped to convince people that the prospect of a solution of the problem of domestic smoke emanation being arrived at through the medium of gas had now, by practical means with which he should acquaint them, been brought well within measurable distance.

The visible pollution of the air by smoke from domestic fires, such as one sees in the haze overhanging even a small village on a calm day, was due, like the invisible pollution that accompanied it, to the burning of coal in its crude state in open firegrates. All visible pollution, and practically all invisible pollution, arising from coal consumption, can be avoided, and all the valuable bye-products utilized, by using purified coal gas in place of the ordinary methods of burning coal.

There was, he said, no domestic operation involving the use of heat that could not be performed as well with coal gas as, and indeed better than, with coal; and if the cost of the actual fuel should be slightly more for coal gas than for coal, this was more than offset by the labour saved in many directions, and by the fact that the use of gas introduced that easy control of the heating medium which permits of perfect economy, whereas in the nature of things the combustion of coal was not subject to any such degree of control.

This had for years been widely recognized as regards the use of gas for kitchen purposes. Already the gas-cooking stove had done much to reduce coal smoke emanation from this source along with an increasing use of domestic gas-heated hot-water supply. But there was only one kitchen chimney in a house, whereas there were a number of coal grates; and the gas-fire, if it was to supersede these coal grates, and so abolish their smoke emanation, had to be so perfected as to be a substitute of more than equal adequacy; for the average man will not be persuaded to do anything towards the purifying of the air, unless he can have means offered him which save him as far as possible any inconvenience from a change of method.

Two years ago at the Birmingham meeting of the British Association, he (Mr. Yates) had been asked to contribute to the discussion on "Fuel Economy," and gave an account of the introduction of gas-fires, their continued use and development, and the objects that the introduction of chemical and physical science into the gas-stove industry had led them to aim at in the designing of such apparatus. Before describing the further important gas-fire problem since grappled with and solved—namely, that of ventilation—he desired to give a short *résumé* of the present state of development of the gas-fire.

Originally, the gas-fire was as nearly as possible an imitation of the coal-fire. It consisted of bunsen burners so arranged that their flames should play on some incombustible material, so as to bring it to a red heat or something approaching this state. It lost much heat up the chimney; and it gave very little radiant heat. The cost of the gas used was out of all proportion to the amount of heat obtained; and the fire was apt to smell, owing to the incomplete combustion of the gas. Gradually it was recognized that if gas-fires were to be made practically efficient on a commercial scale, their economic and hygienic aspects must be studied. At first, the economic aspect was almost exclusively dealt with; effort being made to extract more heat from the waste products before their escape by the chimney—the heat thus extracted being returned to the apartment as heated air. In other words, these early efforts in gas-fire economy aimed at concentrating on convected heat. There was undoubted economy effected; but it was accompanied physiologically by a bad effect. The convection currents were so hot that the percentage saturation of the air of the apartment was lowered, with the result that moisture was abstracted from the skin and mucous membranes of the occupants, and they suffered unpleasant sensations of dryness, pricking of the skin, and so on. Further, owing to the air of the room being hotter than the walls (because of the heat being mainly transferred to the latter by the medium of the air), persons sitting near these might yet experience chilling sensations owing to the radiation from their bodies to the colder walls.

As a result of these drawbacks, gas-fire heating fell into bad repute; and the position became one only to be retrieved by most strenuous research and effort. In this fresh effort, the vital importance of the hygienic aspect was at last fully recognized. Concentration was made on radiant heat; but care was taken to avoid straining after this to an excessive extent, or in the direction of over-intensity. The bad results of high temperature convection being recognized, special convection contrivances were dropped. But the absolute necessity for retaining a certain amount of low temperature convected heat to supplement the radiant heat was not lost sight of; and express provision for this was made. Some progress was also made in improved ventilation. This represented the gas-fire position at the date of his previous contribution, already referred to.

Mr. Yates then more particularly dealt with the question of radiation and the influence on it of high and low canopies. Since that date, he had set himself the task of removing the last major objection to the gas-fire as compared with the coal-fire; and he proposed to give a brief account of the successful accomplishment of this task and of the advance effected, since all improvements tending to make the gas-fire more acceptable to the public had an important bearing on the discussion taking place.

The speaker had mentioned a short time ago the question of ventilation. In this country, people had always been accustomed to the open fire grate in their houses, and, generally speaking, depended almost entirely on the chimney for the removal of air and the ventilation of the room. This method was by no means ideal; for one thing, not infrequently the removal of air by the coal-fire *viâ* the chimney had been so great that the occupants of the room had found themselves inconvenienced by the excessive draught near the floor. But as the majority of rooms in houses are ventilated by the fireplace, it is necessary, when a gas-fire is installed, that means be devised to ensure its fulfilling this function to the best advantage. This was far from being the case with gas-fire heated rooms of even a very few years ago. The fire was placed in front of the coal-grate—very often with a sheet of iron behind it, thus partly or wholly blocking-up the entrance to the chimney, except for the flue outlet of the gas-fire itself. As in many cases this outlet was of very small dimensions, the amount of air that it withdrew from the room was quite insufficient for adequate ventilation. In some gas-fires the flue vent and canopy were so designed and proportioned as to draw a large volume of air up the flue; but while in this way quite good ventilation was produced (much exceeding anything previously reached in gas-fire practice), yet even with such improved fires—free as they were from so many of the objectionable features of the old high-temperature convection gas-fires—the comfort resulting from the ample air-change effected by the coal-fire remained to seek.

Though the working of the gas-fire itself afforded entire comfort in a room, yet if it were kept going all day, it was noticeable that the atmosphere was not so pleasant as the day wore on; and in the evening, when the number of the occupants increased, and particularly if gas were used for lighting, then the stuffiness became considerable and people blamed the gas-fire. It was, indeed, the gas-fire that was to blame. It, however, had nothing to do with its own working as a fire, but was entirely due to its indirect effect on the atmosphere by blocking-up the chimney, and largely restricting the ventilation. Unless this single disadvantage under which the gas-fire still laboured, as compared with the coal-fire could be removed, the use of gas-fires, extensive though it already was, was bound to remain permanently confined to those householders who adopted it purely as a matter of labour-saving or convenience—instead of broadening, as it ought, into universal adoption—because the great body of the public would still remain more or less opposed to gas-fires on account of the stuffiness which he (Mr. Yates) had referred to, and which they would continue to associate with the gas-fire itself, although, as was explained, it was only due to this apparatus in an indirect way.

He therefore set about endeavouring to produce a fire which should give an ample and controllable ventilation of the room. This major problem was complicated by several other conditions, which, though minor in comparison, were yet of such importance that they had to be regarded as indispensable. Great practical difficulties had been experienced as regards these minor conditions—not so much in attaining them individually, as in the complicated task of reconciling them with each other in the one apparatus. By continued effort, however, the objects in view had been eventually all achieved. The fire thus produced, in addition to its embodying the various points of design and construction called for by modern practice, had the further feature (distinctive to itself) of embracing a special contrivance, simple in appearance, but for long most baffling in the course of its evolution, by which, in injector fashion, a very large amount of air was removed from the room.

Briefly described,[*] this contrivance provides two outlets to the chimney. The conformation of these and of the adjacent parts is so proportioned, as the result of much experimental work, that by the under outlet the entire combustion-products are carried off, while by the upper or ventilating outlet a large volume of ventilating air is removed—the volume being controllable by a ventilation regulator.

Anticipating queries that might be raised, he said he would deal first with the question of what should be considered as the degree of ventilation necessary in a living-room. It was generally accepted by the authorities that the air of the room should be changed not less than three times per hour; and to attain, and if possible exceed, this figure was the task before them. During the perfecting of this fire, many tests had, therefore, been made with a view to ensuring that its results in this regard, compared with existing gas-fires and with the coal-fire, should be such as to justify its being brought to public notice. These tests had been made in an ordinary room with a chimney 30 feet high. In a series of tests taken under identical conditions, as far as it was possible to control them, and using various makes of modern gas-fires of the same size, the following results had been arrived at:—

The new ventilating gas-fire	. .	11,800	cubic feet per hour
Ordinary gas-fires (*a*)	. . . .	4,500	,, ,,
(*b*)	. . . .	4,850	,, ,,
(*c*)	. . . .	5,600	,, ,,
(*d*)	. . . .	5,000	,, ,,

This shows an increase to over double the air removed by the nearest ordinary gas-fire. One possible objection anticipated was the suggestion that, although the air is removed, yet it merely takes a path along the floor to the fire, and that therefore the air at the breathing level is practically stagnant. To test this point, samples of air were taken (through pipes) from points arranged along the three axes:

(*a*) At right angles to the fire, and 4 feet from the floor.
(*b*) At 6 feet from the fire, and vertical.
(*c*) Parallel to the fire, 4 feet from the floor, and 6 feet from the fire.

These axes intersected at one point.

The results of these tests proved that ventilation extended along all the axes, and at least above the breathing level, which is at a height of about 3 to 4 feet for a person sitting. Thus any possibility of merely local ventilation had been studiously avoided—the fire drawing in air from all parts of the room. He (Mr. Yates) said he had the results plotted graphically and the various sketches and diagrams, which were practically self-explanatory, showed that the ventilating gas-fire greatly exceeded the ventilating capacity of the ordinary gas-fire, and approached that of the coal-fire as closely as was necessary, or indeed desirable—having regard to the discomfort to which he had referred as sometimes experienced with coal-fires owing to their possibilities in the direction of excessive draught.

Mr. Yates closed by summing-up briefly the effect of this most recent gas-fire development in its relation to the smoke problem. Already, and apart from this development, the modern gas-fire had been taking the place of the coal-fire in many hundreds of thousands of cases. Now that it was equipped with this ventilating provision, added to the other great improvements of recent years, he regarded the gas-fire as having become more than the equal of the coal-fire in every respect; and he believed that it had now brought within the range of practical politics a vast extension of the use of gas-fires such as would amount to the practical supercession of the coal-fire throughout the country, and which, but for this ventilating provision, would have remained permanently impossible. He had already referred to the general adoption of gas cooking-stoves, and to the gradual introduction of gas-heated appliances for domestic hot-water supply. Architects had recently begun to take much interest in the progress of gas-fires, and large numbers of them were now made in the form of grates for building into fireplaces. There was thus good reason for the belief that ere long the present fashion of equipping new houses with built-in coal-grates would be gradually discontinued, and gas-grates would be built-into new houses instead.

He was far from suggesting that the gas-fires had now reached finality of development. He could himself see several directions in which there was room for a certain development; but he believed he was speaking without over-sanguineness, and from a due acquaintance with the circumstances, in saying that he looked forward with confidence to the coming of the ideal state of things, when houses would rely upon gas for cooking, warming, and hot-water supply. In fact, with the rapidly increasing adoption of gas-fired steam-boilers and of the gas-heated furnaces to which he had referred, he looked forward to the entire disappearance of the smoke problem—both domestic and industrial.

Oxidation of Coal during Storage.

From tests made with Philippine coal, as to the rate and amount of oxygen absorbed by coal during storage, Mr. A. J. Cox, in the "Philippine Journal of Science," states that oxygen is first absorbed and that subsequently carbon dioxide is given off. The production of carbon dioxide does not take place simultaneously with the absorption of oxygen. Regarding the calorific value of the pure coal-substance—that is to say, the water and ash-free coal—it was found that in all cases the calorific value is reduced by prolonged storage in contact with air. When coal is stored in the presence of an inert gas (such as carbon dioxide or nitrogen) no deterioration occurs.

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[*] See illustration, "JOURNAL," Oct. 13, 1914, p. 75.

MANCHESTER CORPORATION GAS UNDERTAKING

By J. G. Newbigging, M.Inst.C.E.

[A Paper read before Section G of the British Association, Thursday, Sept. 9.]

The brief account of the Manchester Corporation Gas Undertaking, which I have the honour to read to you, is in no sense a paper. It is merely a collection of notes prepared for the purpose of adding interest to the visit which I hope will be paid by some of the members of the Association to the works of this important branch of Manchester's municipal enterprises.

Gas-works were established in Manchester, in the year 1817, by the Commissioners of Police, who were at the time the governing body of the town. In the year 1824 the sanction of Parliament was given to the first Manchester Gas Act, which was also the first legislative recognition that public funds could be utilized for gas-supply purposes. In the year 1843 the powers and the duties of the Commissioners were transferred to the Corporation; and from that time the gas-works became municipal property.

The extent to which the undertaking has grown during the intervening seventy-two years is revealed by an examination of the last published accounts of the department for the year ended March 31, 1915. From these accounts it will be seen that the total value of the works and of the distributing plant, &c., is £3,335,019. Since the year 1843 the sum of £1,884,280 has been placed to sinking fund, out of the revenue of the department, for the repayment of loans. During the same period net profits, amounting to £3,217,174, have been applied to the purposes of the Improvements, Water-Works, and Finance Committees of the Corporation. The price charged for gas in the year 1817 was 14s. per 1000 cubic feet; in the year 1843, 6s. per 1000 cubic feet; and for the year ended March last, 1s. 11·74d. per 1000 cubic feet.

The outstanding debt for the year ended March, 1915, was £1,002,095, or 3s. 5d. per 1000 cubic feet of gas sold, which is the lowest of the larger gas undertakings of the United Kingdom. The output of gas in the year 1844 was 248 million cubic feet; and during the last financial year it reached 6237 million cubic feet, or an annual average increase of 4·75 per cent. The total revenue from all sources last year was £757,167.

As illustrating the extensive character of the undertaking, the works and other properties cover an area of nearly 82 acres, and the distributing mains and service pipes a length of 1440 miles—including 7½ miles of high-pressure mains.

The undertaking has reached its present strong financial position through the Committee having the administration of its affairs not failing continually to avail themselves of up-to-date and economical methods of manufacturing gas. At the same time, regular reductions have been made in the price of gas, and other concessions given to consumers in the shape of free gas-cookers, and low rentals for gas-fires.

Recent Improvements of Plant.

A brief reference to the important features of the works, more particularly recent improvements, will be of interest.

In the first and most important process of gas making—carbonization—the undertaking has occupied a foremost place in the gas industry. Not only was Manchester one of the first to adopt mechanical stoking for charging and discharging retorts, but also constructed one of the earliest installations of inclined retorts, where the charging and discharging are effected by the natural gravitation of the material—thus dispensing with the use of any machinery for the purpose.

The charging of retorts by gravity, and at the same time passing the coal continually through the retorts, instead of charging them at intervals, has always been an ideal of gas engineers; and this has been accomplished by the introduction, within recent years, of retorts set in the vertical position. Many difficulties confronted the use of retorts so constructed; but modern skill and ingenuity have succeeded in overcoming these, and the carbonization of coal in vertical retorts is now an accomplished fact.

Vertical Retort Carbonization.

In this system of carbonization the coal is elevated to the top of the retorts (usually about 23 feet long, and rectangular or oval in section), and passes continuously through, at the rate of 2 to 4 tons per 24 hours. By the time the coal has reached about two-thirds of the distance down the retort, the whole of the gas has been expelled from the coal; and the coke leaves the bottom of the retort in such a cool state that it requires little or no quenching—thus producing a practically dry coke for sale.

The heat in the coke is abstracted before it leaves the retort by passing cold air through fire-clay flues surrounding the base of the retort; and this air, becoming heated, is utilized for the combustion of the producer gases generated from the coke for the heating of the retorts.

The operating advantages of the system as compared with the intermittent are many. Among the more important are: Saving in labour, minimizing of nuisance to the surrounding neighbourhood, and avoidance of loss of gas and other valuable products which necessarily results from periodical opening of the retorts for charging and discharging. A further marked advantage is that the composition and calorific value of the gas flowing from the retorts are uniformly maintained, and yields of gas of 13,000 to 14,000 cubic feet per ton of coal are obtained with a minimum percentage of inert gases in the composition. This uniformity of calorific power and composition is all-important, as Parliament has discarded the luminous test, and now imposes the calorific test on all gas undertakings seeking fresh powers.

Manchester has taken a prominent part in the pioneer work on this system of carbonizing coal, and one of the largest installations in the country has been erected at the Rochdale Road works. It is worth a visit, as illustrating the success which has attended the efforts to advance the carbonization of coal for the production of coal gas in a scientific direction.

The Bradford Road Gasholder and Tank.

At the Bradford Road works a gasholder has been recently constructed of a capacity of 10 million cubic feet; and as it is one of the largest structures of its kind in the world, it is of more than passing interest.

The tank in which the holder floats is 285 feet in diameter, and 43 feet deep. It contains 9,042,018 gallons of water, or 40,366 tons; and 4 million bricks were used in its construction. The floating portion of the holder weighs 1600 tons, and the guide-framing in which the holder works 1480 tons; the framing rising to a height of 170 feet from the ground-level.

High-Pressure Gas Supply.

The distribution of gas at very much higher pressures—equal to that given by a column of water 80 inches high, in place of the ordinary 4 or 6 inches—has come into vogue during recent years, and is becoming increasingly appreciated in Manchester for both lighting and industrial use. We have already 7½ miles of high-pressure steel mains laid in the city; and these are continually being extended. With this higher pressure, the illuminating value of the gas in incandescent lighting is increased two to three fold —due to the better admixture of the air and gas in the bunsen burner, and the concentration of the flame into a small bulk of increased temperature. In certain industrial uses where rapidity of work is essential, it is also found advantageous to use this high-pressure supply.

Projected New Works at Bradford Road.

New works of a capacity of ten million cubic feet of gas per diem have been projected on the Bradford Road site. The plant will include an electrical installation for generating the power required in the manufacturing processes, and the handling of the enormous quantities of coal, coke, and other material. These works should have been commenced this year, but the high interest for loans, the high price of all constructional material, and the restriction of Parliament, have rendered the postponement of the work for a time necessary.

Bye-Products and War Explosives.

The present war has brought gas-works into prominence because coal gas and the bye-products obtained from its manufacture contain substances which either form the basis of valuable explosives or else are used in their manufacture.

Coal tar has hitherto been one of the chief sources of toluene; but since the extraordinary demand for this substance for the manufacture of the high explosive "T.N.T.," attention has been drawn to the fact that the major portion of the toluene produced in the carbonization of coal remains in the gaseous state, and investigations have been made as to the best means of extracting it without unduly reducing the calorific value of the gas. The result has been that simple methods of washing the toluene out of the gas with tar and suitable oils have been devised—afterwards separating the recovered toluene by a process of distillation. Manchester, in common with other large gas undertakings, is doing its share in producing this important munition of war.

It is an unfortunate circumstance that, for a few years before the war, Germany took large quantities of benzol from coke-oven plants in this country—evidently in preparation for the onslaught upon us. We have, therefore, a great deal of leeway to make up for the loss of this valuable residual, at, of course, an enhanced cost to us.

The tendency of Parliament has been to discourage, and even to restrict, gas undertakings desiring greater liberty in the manufacture of bye-products; but to-day under the national emergency they are encouraged to widen their scope, and it is to be hoped that this attitude of Parliament towards gas undertakings will continue after the war. Not only are certain bye-products of gas manufacture necessary in the fight for military supremacy, but there are others equally valuable in the struggle for commercial supremacy.

Utilizing the Residuals.

At our Bradford Road works we have a plant for the manufacture of sulphuric acid from spent oxide, capable of yielding acid of 120° Twaddel, equal to 3700 tons of pure acid per annum. It consists of a set of sixteen five-shelf burners, four chambers, and the usual Glover and Gay-Lussac towers. This acid is used to convert the ammonia recovered as ammoniacal liquor from our four works into sulphate of ammonia; the yearly production being approximately 5000 tons. The plant is arranged in two units, each unit having two combined free and fixed stills, and a closed saturator with self-discharge.

Hitherto the Corporation have left the distillation of tar to private enterprise; but the changes that will be created by the war may render it advisable for this branch of practical chemistry to be widely practised in gas-works, to at least the extent of producing the primary products, so as to reduce its bulk and save the cost of transporting the crude tar.

This industry is the pivot upon which other great industries turn—perhaps the most notable being the manufacture of dyestuffs. Any economic service that gas-works can render to the effort which this country is making to free itself from dependence upon other countries for the supply of this important trade requirement, should be freely given.

Gas Profits and the Rates.

Great as the success of gas enterprise in Manchester has been in the past, it cannot be expected that this will be maintained unless the department is allowed to sell gas at cost price—in other words, relieved from the burden of contributing large sums annually in relief of rates.

The department pays rates and taxes in the ordinary way, like any other trading concern, amounting in the last financial year to £54,885, or 2·23d. per 1000 cubic feet of gas sold. So that the contribution to the relief of rates of a further £50,000, or 2·04d. per 1000 cubic feet, is in a sense a supertax on gas consumers.

Notwithstanding the frequent discussions that have taken place on the question, I am afraid the injurious effect of this policy is not fully realized, and that its continuance is seriously crippling development in a direction which would be most beneficial to the inhabitants and trade of the city. I refer to the displacing of smoky solid fuel with gaseous fuel; this being practically the only direction in which town gas can make any material progress.

It is interesting to recall that Mr. John Shuttleworth, the Chairman of the Gas Committee in 1862, read a paper before this Association at their meeting in Manchester that year. In the course of his remarks, he stated that one of the advantages of the municipalization of the gas-works in Manchester was that the profits—*so called*—could be applied to general purposes. He showed how valuable had been the application of such money to street-making—much needed in Manchester at that time. He also resented the suggestion that gas should be sold at cost price, as in fact had been advocated as far back as the year 1824, and which agitation was the cause of many riotous meetings of citizens.

The conditions of gas supply have, however, so changed since that time, that the question is not now as to whether it is right or wrong that a ratepayer who is not also a gas consumer should receive some return for his assumed liability on the capital expenditure, but the more important one of jeopardizing the prosperity —I almost said existence—of an undertaking on which a sum of over £3,000,000 has been expended.

The advent of the practical application of electricity took away the monopoly which gas previously enjoyed; and it is becoming more and more evident that each of these commodities has, to a very great extent, its separate and distinct sphere of usefulness. I have only to point to the records of the two departments in Manchester in support of this assertion.

Competition between Gas and Electricity.

From statistics I compiled some time ago covering the period 1909-13, I found that the increase in the use of electricity for power purposes over the five years was no less than 155·2 per cent.; and the use of gas for cooking, 30·18 per cent.—these being the directions in which each of these commodities had made the greatest progress. For private lighting, gas was practically stationary, only showing an increase for the same period of 0·2 per cent., and electricity an increase of 7·5 per cent.

The number of cooking and heating appliances supplied to the consumers now totals 134,382—a great impetus being given to the use of cooking-stoves by the abolishing of the charge for hire in the year 1903. This number is apart from those privately owned, of which we have no record. These appliances, including gas-engines, consume 1541 million cubic feet, or 26 per cent. of the gas sold. The Gas Committee only commenced to let out gas-fires on hire in the year 1911; and the number fixed up to the end of the last financial year was 17,083 (included in the above figures). These are estimated to consume no less than 195 million cubic feet of gas per annum.

These figures demonstrate that during the last decade the use of gas for cooking and heating, and industrially, has made good progress in Manchester; but what is wanted is a much lower price than has hitherto been charged, in order to consolidate its position, remove it from merely intermittent to constant use, and encourage its still more general adoption.

Although the field for gaseous fuel is illimitable, its permanent displacement of solid fuel depends mainly on the price at which it is sold, and that there is little difference between the comparative costs of the two fuels for a given purpose.

In the case of a municipality controlling both gas and electricity supplies, there is no reason why the former department should not eventually become the gaseous fuel supplier, and the latter the light supplier.

Gas of a calorific value of 250 to 300 B.Th.U. per cubic foot would be an admirable fuel, and could be cheaply produced. Such a gas could then be freely used in a cheap type of gas-fire which is now made adaptable to existing coal-grates, and hardly distinguishable from a coal-fire.

Gas still required by those who preferred it for lighting and for street lighting would be taken from the high-pressure mains, or even the existing mains at a higher pressure than is now maintained. This lower quality for lighting in an incandescent burner is as efficient at high pressure as a much better quality is at low pressure. For power and industrial purposes it would also be cleaner and superior to any producer gas.

The Fuel Question of National Importance.

Of course, in expressing these opinions I know I shall be condemned as a heretic by those interested in private gas enterprise. Nevertheless the fuel question is of such importance to the nation that it requires to be at once tackled with greater energy than has hitherto been shown. The gas industry has a better opportunity than any other industry of solving this fuel question, and with it the smoke problem, and so placing itself in a stronger position than it now holds.

After the war there will be vast possibilities in the direction of extending the use of gaseous fuel; but unless gas undertakings set their house in order, so that immediate advantage can be taken of the opportunities that will arise, they will, to a great extent, slip from their grasp.

Germany has long since recognized the value of coal gas for industrial purposes as a means of lowering the cost of production in many trades, and so assisting competition with other countries.

Town gas at a low price promotes day consumption, materially helps in the abolition of the smoke nuisance, economizes our coal resources, and broadens the basis of the general prosperity by encouraging the growth of a variety of minor industries whose existence largely depends on the availability of a cheap, cleanly, and handy fuel.

Local authorities in possession of gas-works, with the best interest of their respective communities at heart, should remove all restrictions in the way of selling gas at a low price.

The President (Dr. H. S. Hele-Shaw), in complimenting the author upon having such a fine works, referred to the time when electric lighting was first boomed and all gas shares went down; and he contrasted that position with the present position of gas. Now, owing to the importance to be attached to the bye-products, it was almost essential to produce gas for the sake of the bye-products. At the present moment, it was essential to do so owing to our German enemies in times of peace having taken away from the very heart of this country the essentials that we now required for ourselves. The result was that things which the Germans in their preparations for the war obtained from us very cheaply, we now had to pay very dearly for. He also congratulated the author upon his vertical retorts, which not only tended to the reduction of arduous labour, but were less deleterious to the atmosphere during operations.

Mr. A. W. Oke (a Director of the Southampton Gas Company) joined issue with Mr. Newbigging on the question of selling gas at cost price. John Stuart Mill was right, he thought, when he said that if municipalities owned undertakings of this kind there should be some profit; otherwise it was not a desirable thing. One was inclined to suspect that in some places electricity was sold at a loss by municipalities; otherwise it could not put up such keen competition with gas. In such cases, it was the large shopkeepers who benefited by competition of this kind. Perhaps Mr. Newbigging, in his enthusiasm for gas, slightly overlooked this fact.

Mr. Newbigging, replying, said it appeared to him that gas did not seem to be wholly appreciated. The general public did not apparently know its capabilities or its value as much as they should do. The President had spoken of the early days of electric lighting, when gas shares went down so seriously in value. They certainly did; but to-day he (Mr. Newbigging) ventured to say there was not a sounder investment than in gas undertakings. As to the cost of gas in Manchester, this varied (as elsewhere) with the price of coal, and the amount of the return from residuals. The highest figure he had reached was when the return from residuals was 90 per cent. of the cost of the coal carbonized. At one of the Manchester works gas had been put into the holders at the lowest price gas had ever been manufactured at in this country—viz., 4½d. per 1000 cubic feet. There were in addition, of course, works charges and distribution.

GAS-ENGINE INVESTIGATIONS.

British Association Proceedings.

At last week's meeting in Manchester of the British Association four communications dealing with the subjects of gaseous explosions, gas-engine efficiencies, and gas producers for steam-boilers, engaged the attention of members in Section G.

Gaseous Explosions Committee.

An interim report only of this Committee was presented, winding up with a recommendation that they be again reappointed, and £50 be granted to them for the ensuing session. The Committee consists of Mr. Dugald Clerk, D.Sc. (Chairman), Professor Dalby (Secretary), and Professors W. A. Bone, F. W. Burstall, H. L. Callendar, E. G. Coker, and Harold B. Dixon, Drs. R. T. Glazebrook and J. A. Harker, Colonel H. C. L. Holden, Professors B. Hopkinson and J. E. Petavel, Captain H. Riall Sankey, Professors Arthur Smithells and W. Watson, Mr. D. L. Chapman, and Mr. H. E. Wimperis.

The report points out that, owing to the war, the completion of the equipment of the new laboratories of the Imperial College of Science and Technology (referred to in the previous report) has been seriously delayed, and the investigation of many problems of importance has had to be postponed. Also, many of the members have been engaged on work for the Government; so that researches on questions under consideration have been either prevented or interrupted. It is not possible, therefore, to present a report to the Association this year. The general work of the Committee, however, has gone on; and during the session three meetings were held, at which the following notes were presented and discussed:—

> Note 36, by Dr. J. A. Harker, on "A Method for the Determination of the Specific Heat of the Working Fluid of a Gas-Engine at High Temperatures."
>
> Note 37, by Mr. E. Griffiths and Dr. J. A. Harker, on "A Method for the Determination of the Specific Heat of Gases at High Temperatures."
>
> Note 38, by Dr. Watson, on "The Variation of the Mean Temperature of the Cylinder Contents with the Change of Fuel-Air Ratio for an Engine using Petrol, Benzol, and Alcohol."

Note 36.—At the first meeting of the Committee there was some discussion on the problem of the determination of the specific heat at high temperatures of the working fluid of the gas-engine by some more direct and, if possible, more continuous method than those hitherto employed by members of the Committee; and the object of the note was to suggest a method which might fulfil these requirements.

Note 37 deals with this problem also, and describes a method which has been roughly tested by the authors, and which appears to have important possibilities.

Note 38 is an account of an investigation on the temperatures reached in the cylinder of a small high-speed four-cycle engine using different fuels, accompanied by a figure giving the results of the experiments.

Experimental Investigation of the Thermal Efficiency of a Gas-Engine.

By Professors G. Asakawa and J. E. Petavel.

At the Birmingham meeting of the Association a preliminary note bearing on this subject was read. The investigation has been continued during the last two years, and has led to the conclusions summarized below. The various losses have been separately determined by measurements based not on indicator card readings, but on the rate of change of the kinetic energy of the rotating parts; and thus the errors inherent to the indicator mechanism have been avoided. In the following summary the performance of the engine is compared with that of a perfect engine working on the same cycle with a similar gas mixture.

Indicated Horse Power.—At full load, under the most favourable conditions, the indicated horse-power of a gas-engine is 88 per cent. of that of an ideal engine working with a similar mixture. This holds true for all except very weak mixtures, for which the relative efficiency is lower. For mixtures containing only a slight excess of air, the above corresponds to an absolute thermal efficiency of 27 per cent. at a compression ratio of 3·75 and 33 per cent. at a compression ratio of 5·6; for mixtures containing twice the amount of air required for complete combustion, the absolute efficiencies are 29 per cent. and 36 per cent. The indicated efficiency relative to the gas-standard falls from 88 to 84 per cent. between full and no load.

Brake Horse Power.—At the full load, the brake efficiency relative to the gas-standard varies from 70 per cent. at the compression ratio 3·75, to 67·5 per cent. at the compression ratio 5·6. This holds true for all except the weakest mixtures, for which the relative efficiency is lower. The absolute brake efficiency is 21 per cent. at compression ratio 3·75, 25·5 per cent. at compression ratio 5·6 for mixtures containing little excess of air, and 23 per cent. and 27 per cent. respectively for mixtures containing twice the amount of air required for complete combustion. The maximum brake efficiency obtained in the present experiments was 27·4 per cent. This occurred at the highest compression ratio for a mixture slightly stronger than this. At light loads, the brake efficiency relative to the gas-standard decreases more rapidly as the compression ratio rises. For the higher compression ratios the increase of theoretical efficiency is just counterbalanced by the increase in frictional loss, and thus the absolute efficiency remains constant.

Mechanical Losses.—The mechanical losses increase slightly in absolute amount with the load and with the compression ratio. For the engine under test [a 25 H.P. "National" gas-engine] at normal speed—200 revolutions per minute—the mechanical losses amounted to 5·6 H.P. at no load, and to 6·3 H.P. at full load when the compression ratio is 3·75; and to 6·5 H.P. at no load and 7 H.P. at full load when the compression ratio is 5·6. The pumping losses are an important part of the total mechanical losses. At a compression ratio of 4·85, they represented 2·3 H.P. at no load, and 2·1 H.P. at full load, or 38 and 31 per cent. of the mechanical loss.

Thermal Losses.—The loss of power due to thermal losses at full load under the most favourable conditions amounts to 12 per cent. of the total available energy; and at no load, to 16 per cent. Of this, less than one-quarter is due to heat transmission during the expansion.

A Unit Gas-Producer for Steam-Boilers.

By E. C. Mills.

Gas-fired boilers may be classified roughly thus:

1. The gas a bye-product from plant installed primarily for other purposes.
2. Grouped producers from which the unpurified gas is piped to boilers.
3. Grouped producers with partial or complete purification.
4. Coal-fired furnaces placed externally to the boiler.
5. Unit bituminous gas-producers delivering gases hot and unpurified direct to boiler.

Class 1 gives very cheap steam, as capital charges are debited to other purposes; but it is not applicable to ordinary or average steam plants. Class 2 is only applicable when fuel is extremely cheap. Class 3, when the gas is produced only for steam-boilers. It is only applicable to boilers of the Bonecourt type. Class 4. This is hardly a gas-producer at all, but is named because many attempts have been made in this direction. It fails mainly by reason of the destruction of the brickwork under the intense heat. Class 5. In this class is the Mills furnace.

All the above, as compared with the ordinary internal fire, have the advantage of not arresting the combustion process by temperature reduction through contact with water-cooled plates.

Single gas-producers for metallurgical furnaces are well known and successful.

The aims of the inventor of the Mills furnace were:

1. It should not be too costly.
2. It must utilize the radiant heat of combustion.
3. There must be ample temperature to endure complete chemical combinations.
4. Access to the boiler for examination and repairs must not be hindered.
5. The whole of the various gases given off by the fuel must be immediately burnt with their sensible heat of production in them.
6. Little or no excess air must be used.
7. All ordinary qualities of coal must be usable.
8. Attendance must not be excessive.

Dealing first with No. 6 (above), the usual allowance of excess air is absolutely necessary in the burning of fuel in solid or lump form, by reason mainly of the mechanical difficulty of bringing each part of oxygen into intimate contact with its concomitant part of carbon or hydrogen at the right time and in the right place. To do this in a metal water-surrounded box is quite an impossibility.

Slides showing outside, inside, and sectional views of the Mills producer were shown by the author. By means of slides, and examples and models of various parts, he was also able to indicate: (1) The action and control of the induced draught giving the separate air supplies for gas production and its combustion; (2) the cellular construction of the roof and walls by which air for combustion is heated by the otherwise lost radiant heat of the producer; (3) the means of withdrawing the whole to allow access to the boiler front; (4) the special design of firebrick gas and air mixing device and burner; (5) the self-cleaning sight-hole appliance; (6) the automatic fuel-feed; (7) the arrangements for clinker-extraction; (8) the flue-gas interceptors introduced; and (9) other details of construction.

The results of tests on a Cornish boiler, worked on an ordinary internal fire and with the Mills producer, with the same fuel in each case, and tested by the same expert, were detailed to show a saving of about 50 per cent.; and there was no smoke. Tests on a Lancashire boiler with the Mills producer were said to give high efficiencies and standardized evaporations ranging from 10·23 lbs. to 11·47 lbs. of steam from 1 lb. of coal; while on a comparison with another boiler fired with the same fuel but with the ordinary internal fire, the tests showed a saving of about 18 per cent. in evaporation. In this case also there was an entire absence of smoke.

The Total Radiation from a Gaseous Explosion.

By Dr. W. M. Thornton.

In a short communication, the author said that the argument by which the lost pressure or suppressed heat of a gaseous explosion is made to depend upon the mechanics of two colliding and cohering spheres may be extended to the case of radiation. The problem was dealt with by him in the "Philosophical Magazine" for September on the following lines. Consider two atoms of equal mass m, approaching one another with equal velocity v, and having equal rotational and translational energies. The total energy of translation before collision is mv^2; the rotational energy, Iw^2. The vibrational energy may be taken as zero at the moment before contact—for radiation is not important until there is chemical combination. The total loss of translational energy on collision, which is equal in the case considered to $\frac{1}{2}mv^2$, is shared between rotation and vibration. If equally shared, the rotational term gains by $\frac{1}{4}mv^2$, the vibration is established, within or between atoms, having also energy of $\frac{1}{4}mv^2$. The total radiation under these elementary conditions should therefore be 25 per cent. of the energy of combination—that is, of combustion.

A complete theory of explosion must account for both the suppressed heat (found experimentally to be half that of combustion) and the energy radiated, which has been observed by Hopkinson and David to be 22 per cent. of the heat of combustion. In the theoretical case of two equal colliding spheres, these are respectively 50 per cent. and 25 per cent. of it. This simple conception, therefore, appears to be capable of explaining these two very important features of gaseous explosion. No reason, *à priori*, has been given for the radiation to be expected; and it is generally agreed that specific heats do not vary sufficiently to account for the loss of the pressure.

According to this mechanical view, an explosion may be regarded as: (1) A process such as ionization by collision causing a loosening of the bonds of the molecule of combustible gas and of the oxygen molecule; (2) attraction between ionized oxygen and combustible gas atoms resulting in a violent rush together, the total translational energy of which is the heat of combustion; (3) formation of products of combustion having a mean translational energy one-half of that of the combining atoms, mean additional rotational energy $\frac{1}{4}$, and vibrational energy $\frac{1}{4}$ of it.

The interchange of energy between (say) rotation and vibration appears to be slower than between translation and rotation; for the pressure is instantly checked on rising, while radiation up to the time of maximum pressure is only 3 per cent. of the total heat of combustion. While the pressure remains nearly constant, the gas continues to radiate; and it is, therefore, in the absence of prolonged combustion receiving energy from the remaining degree of freedom—*i.e.*, rotation. Any excess of rotational energy is shared between the other two terms; and in the process suggested there should be both persistence of pressure and of radiation.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Dividends.

Sir,—At an ordinary general meeting of a company, recently held and reported in your columns, an incident occurred which seems to invite further attention.

From your report of the proceedings, it appears that, in proposing the adoption of the Directors' report, the Chairman said:

> "Heretofore the Directors had recommended a dividend free of income-tax; but, if they were to keep the rate to the previous level of 5 per cent., they would be obliged in future to deduct the income-tax. No one could have seen that the income-tax was going to jump in the way it had; and it was only right that it should be brought to the notice of the shareholders that it would be impossible to pay the dividend free of income-tax. If this was done, the dividend would probably be 4½ instead of 5 per cent."

After the report had been adopted, a shareholder proposed the dividend named in the report—5 per cent.—free of income-tax; and this was duly seconded and carried.

It seems not to be so generally known as would be desirable that, unless specially authorized by the Private Act or the Articles of Association of the Company, an amendment to increase the amount of the dividend recommended by the Board of Directors is *ultra vires*. In regard to companies working under the provisions of the Companies (Consolidation) Act, 1908, section 95 of Table "A" enacts that: "The company, in general meeting, may declare dividends; *but no dividend shall exceed the amount recommended by the directors*." In regard to companies incorporating the Companies Clauses Acts, section 120 of the Act of 1845 enacts that: "Previously to every ordinary general meeting at which a dividend is intended to be declared, the directors shall cause a scheme to be prepared showing the profits, if any, of the company for the period current since the preceding ordinary meeting at which a dividend was declared, and apportioning the same or *so much thereof as they may consider applicable to the purposes of dividend*, among the shareholders. . . . and shall exhibit such scheme at such ordinary meeting and at such meeting a dividend may be declared *according to such scheme*."

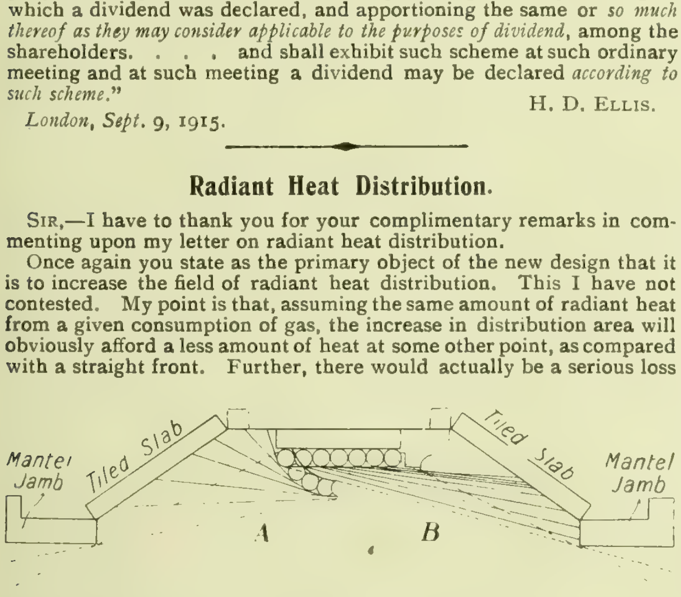
H. D. Ellis.

London, Sept. 9, 1915.

Radiant Heat Distribution.

Sir,—I have to thank you for your complimentary remarks in commenting upon my letter on radiant heat distribution.

Once again you state as the primary object of the new design that it is to increase the field of radiant heat distribution. This I have not contested. My point is that, assuming the same amount of radiant heat from a given consumption of gas, the increase in distribution area will obviously afford a less amount of heat at some other point, as compared with a straight front. Further, there would actually be a serious loss of heat by radiation into the fireplace. The enclosed sketch clearly shows this; the sideways limit of the radiating lines of the respective fires being indicated by lines, the usable by dotted lines—half section "A" representing a circular, and half section "B" a straight front.



The tiled slab and mantel jamb on "A" side will receive, of course, a great amount of radiation in addition to the sideways indicated.

With regard to the secondary object of additional appreciation by the user, this is hypothetical, and does not arise out of the criticism I ventured to put forward, which dealt with scientific facts, and not with questions of taste. You cannot eat your cake and have it; neither can you increase the radiation distribution area, unless the gas consumption is also increased to make good the losses in the direction in which radiation has hitherto been regarded most useful.

The increased area achieved by altering the design is of little practical use in room heating with the big majority of modern room fixtures. You state that the semi-circular fronted fire carries the effective lines further back; yet you say you do not think anyone would want to sit there. I agree.

Exception must be taken to your statement that the round-fronted fire is a new kind of fuel placement. I have not overlooked the fact that from a round-fronted fire you will get radiation directly in front of it; but I repeat you must have a larger fire area, and therefore a larger consumption of gas, to get in the usable part of the room the same amount of heat as you get from the straight-fronted fire.

In speaking of side draughts, I do not imply merely those created by air inlets and outlets, but also the draught set up by persons passing across in front of the fire. It is astonishing what little air movement is required to bring out the products.

Jas. W. Wilson
(Wilsons and Mathiesons, Limited).

Leeds, Sept. 11, 1915.

[Mr. Wilson's present letter (which came to hand just as we were preparing for press) is perhaps even more interesting than the one published last week. It is pleasing to find that we are on common ground in agreeing that the new design of fire ("new design" taken as a whole, and not in part) will increase the distribution of the radiant heat. He says he does not contest this. His main contention, as now stated in precise terms, is that, "assuming the same amount of radiant heat from a given consumption of gas, an increase in distribution area will obviously afford a less amount of heat *at some other point*, as compared with a straight front." Then we may put the converse proposition: With a straight-faced fire, the radiant heat, with the same consumption of gas, will be less at certain points and more at another point than with the semi-circular fire. That is the corollary of Mr. Wilson's proposition. The real question is which is the best distribution for practical purposes—the more concentrated or the more distributed radiant heat. Every part of a room should be "usable;" not a certain part only. With some fires and in some rooms, it would be a decided advantage to reduce the frontal heat somewhat, and send it in other directions. Whether the fire has semi-circular or straight-line fuel placement, the amount of heat sent into the room is the same; it is only a question of its more equable distribution by the one fuel disposition than the other. There is the point, too, that, as constructed, the semi-circular fire in question will, we believe, show a radiant efficiency somewhat in excess of what the makers have shown with a straight-fronted fire, and they have not hitherto been behind the best attained standards in this respect. This we think will be admitted even by their trade rivals. Mr. Wilson sends a sketch with his letter showing the semi-circular fronted fire in a recessed fireplace, to illustrate the absorption of some of the radiated heat by the side tiling. If our correspondent will look at the top illustration on p. 445, he will see that the idea is to use the fire for straight filled-in mantels, and not recessed ones. Then Mr. Wilson remarks: "You state that the semi-circular fronted fire carries the effective lines further back; yet you do not think anyone would want to sit there." That is a perversion of our statement, which was (top of p. 494): "No sitter, Mr. Wilson also says, would wish to be *behind* the line of effective radiation. Certainly not; and the semi-circular fire carries the effective line further back." Which we fancy will be interpreted by most readers as meaning that the sitter could go farther back with the semi-circular fuel placement before getting "*behind* the line of effective radiation." With regard to draughts, it is unnecessary to repeat the observations that were made last week (p. 494). The modern fires with which we are practically acquainted do not give any inconvenience by their flames and the current of products of combustion being unduly sensitive, though installed in all sorts and conditions of rooms, in which people are freely moving about.—Ed. J.G.L.].

Alliance and Dublin Consumers' Gas Company.

Sir,—I am sure a silent prayer was offered up by many of your readers interested in the above, on seeing your correspondent "Anticipant's" letter in last week's issue. He voiced hopes, present and future, which all the shareholders will heartily echo. These are days when we want all the optimism we can get hold of; and I would be the last one to call up any little cloud on the horizon to darken the outlook. But it is essential our optimism should be genuine.

Your correspondent builds his castle of financial possibilities from the table set forth of the gross profits of the Company for the years 1910 to 1914 inclusive, and summarizes the matter in the words, "The tide has again turned." That it has apparently turned, the severest critic, I think, will quite admit; but that there was ample room for the returning sweep to be made will also be admitted by all concerned. In short, the low-water mark reached in 1913 was a very low one indeed. I do not agree, however, that we can read into the figures for 1914 the fact that we are in the swing of the high tide under the full moon of prosperity.

In your issue of March 30, 1915—following the receipt of the Directors' report and statement of accounts for the half year ended Dec. 31, 1914—appeared from me a letter pointing out fully my reasons for a chastened enthusiasm; and I would refer your correspondent "Anticipant" to what was there set out in a genuine desire to gauge the situation broadly and fairly. I showed then that, working on the basis of previous half years, and taking cognizance of past practice (wise or unwise) the gross profit for the half year suffered a very serious reduction. To be concrete, we got a comparative figure of £24,619, instead of £53,111. I invited the Directors' comments; but none have been forthcoming, and naturally, initial optimism received a decided set-back. I further pointed out the decrease in the sales of gas by some 4 per cent., as compared with the corresponding half year ending 1913, and also referred to the very high percentage (12¼ per cent.) of unaccounted-for gas. All round, after close scrutiny of the printed accounts—the only source of information available—very much of the brightness of the outlook disappeared. I have not yet received a copy of the report and accounts for the half year just ended; but if they follow the lines of those above criticized, we will be indulging very much in the dark any feelings of satisfaction that first glances may give us.

One cannot help thinking there is something mysterious about the workings of the concern since the upshot which ended in the new constitution of the Board some fifteen months ago. We have all waited with the patience becoming a Job for the experts' report on which "Anticipant" lays so much stress. And rightly sô; the dark is ever disconcerting and pregnant with imaginings and forebodings. Why have we been kept so long in the dark? It is not conducive to optimism—very much the reverse. The prime movers (*) in the original intention to have the Company's affairs thoroughly sifted and daylight admitted, so that the shareholders could judge for themselves, are now members of the new Board, which makes silence more significant. The infusion of new blood on the Board was a vitally necessary step; and the introduction of a Consulting Engineer and Consulting Accountants of high standing was procedure that one and all welcomed. But surely ample time has elapsed for a full pronouncement as to their labours and policy to have been forthcoming. If it is not to be given at the coming meeting, then it will be high time to appoint a committee of shareholders with definite powers to "get a move on" (to use a colloquialism). Otherwise such good as may have in reality been achieved by the "powers that be" will be largely negatived.

It is idle to applaud until the curtain that has been kept so long down has been rung-up. The three English Directors who were appointed have likely, at much personal sacrifice, rendered worthy yeoman service to the concern; and no doubt appreciation will be voiced. But it is impossible to pay definite tribute while we are still in the dark as to all that has been attempted, all that has been accomplished in the interests of the Company and of shareholders on both sides of the water. "Many hands make light work;" and, with the expert assistance now available, trials and difficulties should be fast declining, and the Company well on that road which leads to permanent security and welcome prosperity. I shall hope to hear so, point blank, on an early occasion.

R. W. Edwards ["Nonulus"].

Aldershot, Sept. 9, 1915.

* P.S.—The writer, as "Nonulus," long preceded others in agitative interest in the Company's affairs, as past numbers of the "Journal" show. But since Mr. F. J. Dickens's circular of Sept. 27, 1913, he has been content to mark-time and observe a patient neutrality. This circular made two definite promises

(*a*) To send a copy of Mr. William Newbigging's report.
(*b*) Dependent on the nature of the report, to call the shareholders together to consult on the situation.

Nothing further occurred until March 16, 1914, when Mr. Dickens issued a further circular-letter, stating that his expert's report—that is, Mr. Newbigging's—had become a joint experts' report, blessed and paid for by the Company; and that its contents were not to be revealed to the shareholders. Now this did not at all absolve Mr. Dickens from his promise (*a*); and as was clearly evident from the experts' expression voiced in the second circular-letter—namely "unsatisfactory as our report indicates the position to be to-day, it is not past remedy"—there were emphatic grounds why promise (*b*) should also have been fulfilled, and the shareholders called together. In short, the report was of such a nature calling for "independent action," but, instead of Mr. Dickens making it his duty (as he promised) to hold a meeting to consult on the situation, he and two friends were nominated to the Board, and nothing further has happened. It would look, therefore, as if advantage had been taken of those who, deeply interested in the Company's welfare, stayed criticism on trust and "sang dumb" under the spell of hopes which have gone unfulfilled. In this connection the general body of the shareholders have a distinct grievance.—R.W.E.

Plea for Economy.—The question of discontinuing public lighting during the coming winter was recently discussed at a meeting of the Bletchingley Parish Council. Mr. Martin, who put forward the proposition, urged that they ought, if possible, to save a little. They were justified in taking this step, because he did not think public lighting was required under existing circumstances. In these times there were not many people about late at night. Mr. Bashford did not believe they would be doing the right thing in abandoning public lighting. Mr. Kent said he agreed with Mr. Martin on the matter of economy; but it was a question whether they did not get more out of the penny rate for lighting than anything else. The Chairman suggested that consideration of the subject should be postponed till the next meeting, in order that the decision of a full Council might be taken. It was decided to adopt this course.

REGISTER OF PATENTS.

Gas-Burners and Gas-Rings.

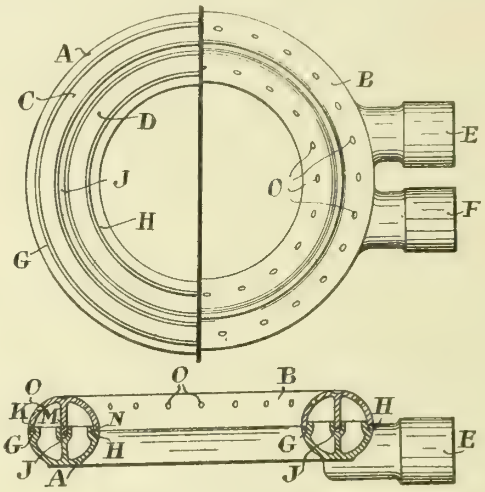
Rasch, L., of South Norwood, S.E.

No. 12,036; May 15, 1914.

This invention relates to gas-burners for cooking purposes of the type in which gas issues from orifices in a burner or ring, the upper part of which is detachable for cleaning.

It has previously been proposed to provide (according to the patentee): (1) A gas-ring of the type set forth with vertical transverse partitions to divide the ring into compartments, each provided with a separate gas supply. (2) A gas-ring with a horizontal partition to form two separate passages, each with a separate gas supply—in this case ready access for cleaning is not provided. (3) A straight, perforated tube burner divided by a vertical diaphragm into separate parallel passages, each provided with a separate gas supply—the burner in this case not being divisible into upper and lower parts.

According to his invention, the burner or ring comprises a perforated tube provided with vertical ribs or diaphragms which divide the tube into separate parallel gas-passages—as shown in the engraving. The right-hand half shows one form of the burner or ring; while the left-hand half shows the detachable member removed. There is also a cross section.



Rasch's Gas Cooking Burner.

A is the fixed member and B the detachable member of the burner. There are two gas-passages C D with independent connections E F for gas supply. The fixed member is provided with annular recesses G H at the outer and inner peripheries of the ring and an annular groove J. The detachable member is formed with depending flanges K, M, N, adapted to engage with recesses and groove G, H, J. O are two independent sets of orifices in the detachable ring through which the gas passes.

Should the jets get stopped up by charred food or other material which eventually finds its way into the gas-passages, they are readily cleaned by removing the detachable member to obtain access to the interior of the ring.

Peat Gasification.

Rigby, T., of Dumfries, and Wetcarbonizing Limited, of Dean Farrar Street, Westminster.

No. 16,918; July 16, 1914.

This invention, relating to the gasification of peat with recovery of bye-products, has particular reference to the utilization of wet carbonized peat, as referred to in patents No. 10,834 of 1903 and No. 17,610 of 1911.

The patentees remark that in the gasification of fuels such as coal in bye-product recovery gas plant—for instance, of the Mond type—provided a sufficient proportion of steam is introduced into the producer, no difficulty is experienced in securing a gas of steady calorific value, and in maintaining efficient bye-product recovery despite considerable changes in the condition of the fuel fed into the producer, and especially as regards changes in moistness such as occur in materials like colliery refuse.

They claim to have ascertained that different conditions present themselves in the gasification of peat, and that to secure constancy in gas composition and maintain efficient bye-product recovery the fuel entering the producer must be maintained as far as possible in the same condition, and, in particular, a steady moisture content must as far as possible be maintained. This difference in behaviour between coal and peat must, they say, presumably be attributed to the difference in the volatile matters present in the respective fuels.

The present invention consists in a method of gasifying (with bye-product recovery) peat fuel in different conditions, and especially as regards moisture content, in which the average condition of the fuel entering the gas-producer is maintained, as far as convenient, constant by controlled proportionate admixture of the different grades of the fuel. It is more particularly a method like that described for gasifying mixtures of briquetted peat and press cakes of peat as are described in the 1911 patent mentioned above, according to which the admixture is effected by automatically measuring out, preferably in a continuous manner, for admixture, the two forms of the fuel in predetermined proportion variable with the respective moisture content, and thereafter thoroughly admixing (also preferably in a continuous manner) the measured-out quantities.

Locking and Closing the Casings of Tar Separator Plunger Bells.

Berlin-Anhaltische Maschinenbau-Aktien-Gesellschaft, of Dessau, Germany.

No. 17,180; July 20, 1914. Convention date, Dec. 19, 1913.

This invention relates to the lever-operated locking and closing devices for securing the removable casings or walls of tar-separator plunger bells on much the same lines as those described and illustrated in the Company's patent No. 16,981—see *ante*, p. 522.

The claims made for the invention include: The combination with the casing of a tar-separator plunger bell of a lever-operated locking and closing device, characterized by one of the two parts forming a toggle-joint and pivoted to the members it is desired to connect—thereby being made adjustable relatively to its corresponding part; a set-screw pivoted to one of the two parts it is desired to connect together; a handle, which can be locked by means of a lock-nut, adjustably mounted on this set-screw; and a yoke or shackle pivoted to the other part, and adapted to engage a notch or the like formed on the handle.

Distillation of Carbonaceous Material.

Hills, H. G., of Manchester, and Thom, R. W., of Southport.

No. 18,576; Aug. 12, 1914.

Many attempts have been made, the patentees mention in their specification, to produce from carbonaceous and bituminous material smokeless fuel which would be suitable either for industrial or domestic purposes. The desire naturally has been to use the cheapest material, which in England is the dust produced in raising bituminous fuel.

In their first efforts to accomplish this purpose they were met with "various difficulties, many of which have been undoubtedly also experienced by others." For example, it has been found impossible in some systems to use fine dust, as the volatile matter could not be drawn off, and also because the dust of some kinds of bituminous fuel (non-caking coal) could not be made to adhere. In other systems there has been difficulty in removing the coke from the retorts, so that it has been broken up in the process. Again, in the production of coke from dust, there is a tendency for the coke to be of a very light fragile nature, so that it takes up a great deal of space, and in transit gets broken into dust.

Their present process consists in the introduction of the material without agglutinants and in a movable container into a vacuum chamber; transferring it thence into a distilling chamber or chambers, where the material is distilled at a temperature below (or but slightly exceeding) the temperature at which tar is formed, from which chambers it is passed in a plastic condition into a cooling chamber, where it may be subjected (if required) while still plastic, to the degree of pressure necessary to produce fuel of the desired density.

They say they have found that bituminous fuel, even of a non-caking quality, can be converted into sound coke if the distillation is carried on within certain limits of temperature—generally between 500° and 700° Fahr.; also, that the volatile matter which causes smoke is produced at temperatures usually below 700° Fahr.; and that below this figure tar and permanent gas are not produced except in negligible quantities.

Their investigation and experiments also show that this volatile matter can be expelled even from powdered coal at the temperature named, if the fuel is submitted to distillation in comparatively thin layers in a convenient form. It has further been demonstrated that coal in a powdered condition makes much firmer and more regular coke than does coal in lumps. They find that it frequently happens that coal at the temperature mentioned is in a perfectly plastic state, whereas at a higher temperature it crumbles to dust. When in a plastic state coal can, it is found, be compressed into firm, dense fuel.

Having ascertained and demonstrated these facts, they devised a complete process and apparatus for putting them into practical use, the following features of which are important: Air must be excluded during the process of distillation; to get the best effect the distillation must be carried on under a slight degree of vacuum; the fuel being treated should be in flat receptacles, divided into compartments to produce the desired size of block; the retort should be heated externally—the heat being so controlled that the temperature can be varied along its length; the retort should have ascension-pipes to draw off the vapour at different points along its length, so that the vapour produced at different temperatures can be collected separately; there should be a chamber anterior to the retort (but connected with it), so that the receptacles containing the fuel can be introduced into this anterior chamber, a vacuum be produced therein, and then a door be opened between the chamber and the distilling chamber into which the receptacles would be at once transferred; at the end of the retort there must be a similar chamber for cooling purposes—the receptacles containing hot plastic fuel being passed into it when the distillation is completed; the plant for compressing the plastic fuel is preferably placed in this cooling chamber; and before the hot fuel is introduced into the cooling chamber a partial vacuum should be created or inert gases introduced—thus preventing explosions in the retort or the necessity to quench the fuel with water.

A suitable arrangement of plant for the purpose is substantially that which is described and illustrated in their patent No. 3284 of 1913—see "Journal," Feb. 24, 1914, p. 517.

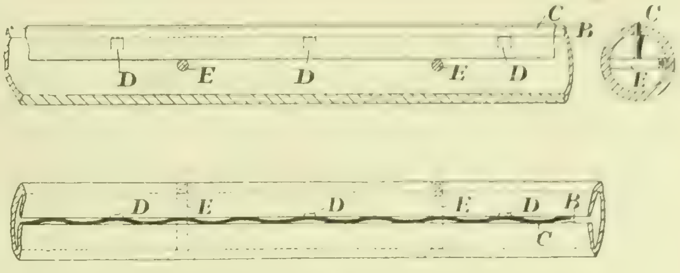
Gas-Burners.

Keith, J. & G., of Farringdon Avenue, E.C.

No. 22,762; Nov. 19, 1914.

These gas-burners, fed with a self-burning mixture, are adapted for use in heating chambers of considerable longitudinal dimensions—*e.g.*, biscuit-making ovens.

The burners are formed of a fine saw-cut, and fitted diametrically of the cross section of the tube are a number of spacing or bridging members formed by screw-threaded pins entering corresponding apertures in the walls of the tube. These pins serve to stiffen the tube against springing action when the sawing operation is being effected and subsequently. The metallic strip serves to preheat the gaseous mixture, and also, "owing to its larger area exposed to the mixture, to protect its outside edges from becoming overheated, and so reduce any tendency to light-back."



Keith's Gas-Heating Burners.

A plan is given of one form of burner according to the invention, with cross and longitudinal sections.

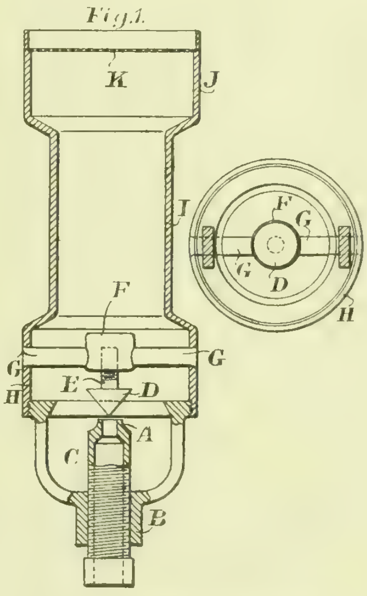
The tube is formed with a longitudinal saw-cut B in which is inserted a crimped or corrugated metallic strip C formed with tongues D struck out from the body of the strip. Screw-threaded pins E are disposed diametrically of the tube perpendicularly to the plane of the cut. To permit the insertion of the strip the screws will be adjusted to permit the cut to gape slightly; the strip being inserted so far that its inner edge abuts against the pins. Thereupon the pins will be readjusted to clamp the strip in position with the free ends of the tongues engaging the inner wall of the tube—the strip being thus restrained against movement radially of the tube.

Atmospheric Burners.

Ewart, J. W., of Mill Hill, N.W.

No. 23,734; Dec. 8, 1914.

These atmospheric burners are of the kind in which there is provided, in conjunction with the nipple through which the gas issues into the air-inlet space at the end of the mixing-chamber, a spreading device arranged so that the jet impinges upon it and is spread or distributed into the mixing-chamber, and "thereby caused more intimately to mix with the air which is drawn in around the gas-jet—the result of such intimate mixture being a more perfect combustion of the gas."



Ewart's Atmospheric Gas-Burner.

Referring to the construction illustrated, A is the gas-nipple, which is externally screw-threaded and engages in a screw-threaded hole in a head B provided on the lower part of the air-inlet space C, so that, by turning the nipple, its position relatively to the air-inlet chamber can be adjusted. D is an inverted cone furnished with a screw-threaded shank E, by means of which it can be adjustably secured in a boss F supported by arms G in the lower part H of the mixing-chamber. The upper end of the mixing-chamber is connected to the lower end of the burner tube I, which is of smaller diameter than H and is expanded at its upper end so as to form the part J, the diameter of which is the same as that of the lower part H. K is a gauze disc supported on a shoulder a short distance from the top end of the burner tube.

The cone D is arranged with its apex in the axial line of the gas-nipple, so that as the gas-jet issues from the nipple it impinges axially upon the apex of the cone, and is consequently split-up or scattered "so as entirely to permeate the whole of the burner mixing-tube." The gas distributed in this way is said to very intimately mix with the air drawn into the air-inlet chamber C in the usual way "whereby a complete combustion of the gas takes place, with the result that the capacity of a burner can be materially increased as compared with burners in which no effective distribution of the gas is effected."

MISCELLANEOUS NEWS.

MELBOURNE METROPOLITAN GAS COMPANY.

Half-Yearly Meeting.

The Half-Yearly Meeting of the Company was held at the offices in Melbourne on July 28—Mr. John Grice (the Chairman) presiding.

The Report and Balance-Sheet.

The Chairman, dealing with the report and balance-sheet, said: The sales of gas for the half year reached a total of 1466 million cubic feet, against 1350 millions for the June half of 1914—an increase of 8½ per cent. Turning to past records, you will see that the output for the past six months equalled approximately our total output for the year 1907. The revenue from sales of gas by meter and public lighting amounted to £314,595, as compared with £289,699 for the corresponding period of last year. From the sales of residuals we obtained a revenue of £71,624, as against £72,126 for June, 1914. The demand for tar, particularly for road-making purposes, has greatly increased during the last few years, and at times it has been found difficult, and sometimes impossible, to supply the requirements during the summer season. Owing to the withdrawal of Continental supplies from the sulphate of ammonia market, the price of this commodity (which had been falling) has appreciated since the commencement of the year, and the prospects in the immediate future are favourable. Owing to increased business, you will find corresponding increases on the expenditure side of the account. The item of repairs at works, £41,538, needs to be specially mentioned. This amount compares with £41,088 for the June half of 1914; but in the latter figure was included £10,000 as a special provision for renewals, to which I called your attention at the time. The amount for this half year represents expenditure which has actually taken place in that period. The Directors are impressed with the necessity of keeping the plant in perfect order, and thereby not only increasing its efficiency, but providing a margin in case either of sudden demands or of a contingency of some kind. We are informed by our Engineer that large expenditure under this heading must continue in succeeding half years for some time yet.

CONTRIBUTIONS TO FUNDS.

Following the expenditure side of the balance-sheet down, we come to contributions to Belgian and Victorian Red Cross Australian sick and wounded funds. A sum of £500 was given to the Belgians, and £2000 to the Australian sick and wounded funds. Though the Directors know perfectly well you will approve of such gifts, and by your adoption of the balance-sheet to-day would confirm their action, they have drawn special attention to them in the report, so that you can clearly understand that by its adoption you not only approve of what has already been done, but you authorize the Directors to act in their discretion in supporting such relief or patriotic funds in the future.

EMPLOYEES ON ACTIVE SERVICE.

Following upon the lines of policy we had adopted prior to our last meeting, we are continuing, until further notice, to undertake to make up to those of our employees enlisting (after twelve months in our service), or their dependants, the difference between the military pay and the rate they were receiving in the employment of the Company. We are also promising to reinstate these men in our service on their return from the war. Up to now no fewer than 170 employees have offered themselves for service in the defence of their country. At the same time, we have notified the fact that during the continuance of the war we do not intend to engage any fresh applicant for adult employment who is unmarried and who is eligible for enlistment. Our next half-year's payment to those who have already volunteered will amount approximately to £1700. We have to record, with regret, the death on active service of three of our employees, and that one has been wounded. A charge of £1042, half-year's premium for insurance which the Company has to pay under the Victorian Workers' Compensation Act, appears for the first time in this balance-sheet as an item of expenditure.

DOMESTIC AND INDUSTRIAL GAS APPLIANCES.

The total number of meters in use at June 30 was 142,858 (including 26,263 slots). At the same date in 1914 the total was 135,937. The recent lessened activity in the building trade is reflected to some extent in the business of our stove department for the past half year; but, notwithstanding this, we have increased the number of stoves in use during the period by 3203—the increase for 1914 was 4400—showing that in houses already erected gas-stoves are being substituted for other methods of cooking. Under present conditions I think we may regard the result as not unsatisfactory. Of bath-heaters, we sold 626, compared with 512 in the June half of 1914. As the result of special efforts to impress upon our consumers the many advantages of gas-fires in place of other forms of heating, we have disposed of no fewer than 2325, as compared with 1538 in June last year—an increase of over 50 per cent. It is gratifying also to record the fact that a large proportion of our business in this particular line has been derived from consumers who previously having had experience with one fire have decided this winter to further extend the use of this labour-saving appliance in their homes. We have sold 190 gas wash-coppers, and fixed 100 burners under existing coppers. Builders and architects are now both advocating the use of these appliances, not only for cottage properties, but for large residences and flats. We have sold 2292 gas-irons during the half year; and their use is extending freely. Grillers and boiling burners, together with special appliances, have sold to the number of 1139. Our lady stove instructors have visited 6496 stove users during the half year; and much assistance has been afforded by them to consumers, who are thereby enabled to obtain the most economical results from gas-cookers. There is a growing demand for the use of gas for industrial purposes, and gas under air pressure has been installed in the premises of a certain number of manufacturers. As demonstrating the appreciation by the public of gas appliances, it might be mentioned that in one large building now being erected in the city for residential flats and professional chambers, we have obtained a contract for installing 22 circulating water-heaters, 22 cooking-stoves, 79 lavatory heaters, and 138 gas-fires. We are extending the use of gas also for high-pressure lighting. One large recently erected factory has been fitted up under this system, and we have also succeeded in introducing it during the half year for the purpose of railway station lighting at St. Kilda. This form of lighting is especially suitable for external illumination; and an installation which was fitted up by this Company at a picture theatre some few months ago has proved particularly attractive and effective, and has given complete satisfaction to the proprietor of the building.

EXTENSIONS.

Of mains we have laid a total length of nearly 27 miles, and 55 miles of services have been put down in the last six months. It has again been found necessary, in order to strengthen the supply in the growing outlying districts, and to secure an efficient gas circulation, to lay several trunk mains. To place the Company in a position to meet the increasing demands made upon us, you were advised twelve months ago that a contract had been placed for the erection of a large vertical retort-house at West Melbourne on the Woodall-Duckham design. The whole of the material for this work has been delivered in Melbourne, and rapid progress is being made in the erection of the house.

ADDITIONAL CAPITAL.

At an extraordinary general meeting of shareholders of the Company held on June 30 last authority was given to the Directors to create and issue 10,000 additional new shares for the extension of works and other purposes of the undertaking, and to borrow £50,000 upon debentures. Acting upon this authority, the shares were sold by public auction. After careful consideration of the whole position, and in view of the condition of the Money Market at the time, we fixed an upset price of £9 10s. per share. The whole issue was disposed of at prices averaging £9 11s. 4½d. per share. The Directors regard the result as satisfactory, having in view the disturbed condition of the financial world at the present moment. Had we been in a position to have sold these shares at the date when permission to issue them was granted by the shareholders, higher prices would have been realized.

An Employee-Shareholder's Remarks.

Mr. Edwin Phillips, in seconding the motion for the adoption of the report and balance-sheet, referred to the stability of the Company's business, and the favourable comparison which the management made with that of other gas concerns.

Mr. H. J. Tait, who supported the motion, said he was present in a dual capacity; being both a shareholder and employee of the Company. He could assure shareholders that the manner in which the employees were being treated by the Directors was very gratifying, and much appreciated by the workmen as a whole. He would like to suggest that the Directors should obtain a group photograph of the employees who had enlisted, which could be kept as a memento of the occasion. The members of the Employees' Association had every confidence in the security of the Company. Last week the Association had secured a further 230 shares in the Company, and now held 710 in all, which cost them £7011. His Association would like the Directors to assist employees who might have suggestions or inventions which might be to the benefit of the industry. The annual leave of six clear days granted to employees was fully appreciated. There were now 1000 members of the Gas Employees' Association.

The Chairman, in replying to Mr. Tait, thanked him for the suggestion of a group photograph. The Manager, Mr. Hinde, informed him that the matter was already in hand. For many years the Company had had arrangements for receiving the suggestions of employees which might lead to inventions; but apparently in those days the staff was not very inventive, for the matter had to be given up. The Directors would, however, be only too glad to receive suggestions or inventions. He was glad that the workers were so interested in the Company. The scheme was like the co-partnership in English gas companies.

The Dividend.

The motion for the adoption of the report and balance-sheet was agreed to, and a dividend of 6s. 6d. per share out of the profits for the half year ended June 30 was declared.

Votes of Thanks.

The meeting concluded with a hearty vote of thanks to the directorate and staff, to which the Chairman, the Secretary and Manager (Mr. John Hinde), and the Engineer (Mr. J. W. Reeson) responded.

ILFORD GAS COMPANY.

The Half-Yearly Meeting of the Company was held at Ilford, yesterday week—Mr. William Ashmole (the Chairman) presiding.

The report submitted stated that the sales of gas for the half year ended June 30 showed a decrease of 1·22 per cent. on the quantity sold during the corresponding period of 1914. This result was brought about by the continued official restriction of lighting. To meet the greatly increased cost of coal and the extra charges which fall upon the Company in consequence of the war, the Directors increased the price of gas 3d. per 1000 cubic feet from the reading of the meters for the Midsummer quarter. After providing for the interest charges, the balance of the profit and loss account available for dividend was £26,194, out of which sum the Directors recommended a dividend for the half year at the rate of 7¾ per cent. per annum on the "A" and "C" stocks, and 6¼ per cent. per annum on the "B" stock, subject to deduction of income-tax. These payments would amount to £7132, and leave a balance of £19,062 to be carried forward.

The Chairman, in moving the adoption of the report and accounts, said he was pleased to report that the general business of the Company had been maintained, notwithstanding the adverse conditions. Not only did they have to pay greatly enhanced prices for coal, but some which they had been receiving was not up to the Company's normal quality; and it had been very difficult to keep the working up to its customary standard. Though there had been the decrease mentioned in the sale of gas—due to the restriction of shop lighting, as well as to the earlier closing of premises—this did not necessarily mean that the Company were not securing new business. They were progressing satisfactorily in many directions, the effect of which would be felt later on. The various extensions in connection with new plant and alterations at the works had been somewhat hampered during the past year, through the shortage of labour; and the fact that they had been dealing so largely with rail-borne coal, all of which had to be handled at the works, had prevented them from using some of their regular hands in connection with the new work. They had at present under erection an extension to the washing and scrubbing plant and a new condenser; and to follow on after these were completed, there was the erection of a tar-tank and sulphate of ammonia still. The Company were doing extremely well with the output of gas appliances, and no doubt would reap a benefit from these in the future. A considerable number of these appliances were fixed in houses where the consumer was already supplied with a meter; and the tendency, therefore, was to increase the output of gas per consumer. The following figures would give some idea of the appliances sent out during the half year; the figures representing the net increases to the numbers on the district. A total of 207 gas-fires had been fixed, 192 gas cookers, 140 meters, and 38 geysers.

The report was adopted, the dividend recommended was declared, and hearty votes of thanks were accorded to the Chairman and Directors, the Engineer and Manager (Mr. W. B. Farquhar), the Secretary (Mr. G. H. S. Iorns), and the staff and workmen, for their services during the half year.

HARROW AND STANMORE GAS COMPANY.

Large Increase in Make per Ton.

The Ordinary Half-Yearly Meeting of this Company was held on Monday of last week, at the Holborn Restaurant, High Holborn, W.C.—Mr. Arthur F. Phillips, M.Inst.C.E., J.P., in the chair.

The Engineer and Secretary (Mr. J. L. Chapman) read the notice convening the meeting; and the report [*ante*, p. 468] and statement of accounts were taken as read.

The Chairman, after expressing regret at the absence in America of the Vice-Chairman, Dr. J. W. Lee Glaisher, and at the inability of one of the Auditors, Dr. C. E. Goddard [who is serving his country at the front], to sign the accounts, proceeded to remark that the results of the past half year were exceedingly satisfactory—especially when the strenuous times through which they had passed were remembered. There was the difficulty of obtaining supplies of coal, and the uncertainty of when it would arrive after leaving the colliery; and there was also inconvenience in carrying on the business, with many of the Company's employees having enlisted in the Army. The total sales of gas were 163,319,000 cubic feet, an increase of 4,013,000 feet, or 2½ per cent., on the corresponding half year of 1914. This increase in the gas sold was highly satisfactory, considering there was a reduction of 3,850,000 cubic feet in the gas supplied to the public lamps, and all outside shop lighting had been discontinued. During the half year the Company gained 90 new ordinary consumers and 105 prepayment consumers, and fixed 200 new cooking stoves. It was from these that the additional consumption was obtained. It was gratifying to report that, while this additional quantity of gas had been sold, there was a reduction of 704 tons in the coal carbonized; and 13,441 gallons of oil less had been used for the production of carburetted water gas. The gas made per ton of coal was 13,402 cubic feet, against 12,257 feet the previous year—an increase of 1145 cubic feet, due to improvements in the retorts and carbonizing machinery. The gas made was under 1 per cent. more, whereas the increase in the gas sold was 2½ per cent., showing a reduction in the unaccounted-for gas of 1½ per cent. The Engineer was of opinion that this might be due to the reduction in the number of public lamps lighted. In this, he was probably correct; for the consumption of gas in the public lamps often exceeded the contract quantity. In the capital account, there was charged as expenditure during the half year for mains, meters, and stoves £1432; but, on the other hand, there was written-off for depreciation and charged in the revenue account £3266. Thus the capital showed a reduction of £1833, which was a pleasing feature with an increased consumption and works maintained in a thoroughly efficient state. The prosperity of a gas company was enhanced by the capital expenditure being low in proportion to the gas sold. This was keenly felt in these times of trial, and would probably have a greater effect in the future. It had been his aim to get down the capital in gas undertakings with which he was connected. It was the means to cheap gas. There was a time when the capital in this Company was excessive; but for some years the Directors had been endeavouring to reduce it, and fortunately with an increasing consumption, improved plant for more economically producing gas, and taking care that revenue bore all proper charges, the position had vastly improved. It was still higher than it should be; but the Board hoped to gradually further reduce it. Turning to the revenue account, coal had cost £8435, against £9523 in the previous year. This reduction was due to the coal having been obtained under favourable contracts made during the spring of 1914, and also to the reduced quantity carbonized. Oil cost £1105, against £1241, less being used; but coke for the production of carburetted water gas cost £232 more, by reason of its higher price. Repairs and maintenance of mains and services figured at £3430, against £1575. Rates and taxes [which were ever on the increase] were £244 more. The other charges were much the same as in the previous year, with the addition of a new expense of £247 war allowances to the dependants of those who were serving their country, which he was sure would meet with the hearty approval of the proprietors. The charges for repairs and depreciation of works, mains, services, meters, and stoves amounted to £9782, and was equal to over 1s. 2d. per 1000 cubic feet of gas sold, which indicated that the Board were aiming at reducing the capital charges. On the credit side of the account, receipts for gas were £29,555, against £28,235. Receipts for coke were £4016, compared with £3815. The increase was not greater because there was less for sale by reason of less coal being carbonized. The price obtained for tar was less by £275. The result of the half-year's work was a profit of £7967, against £7884 the previous year. Interest on debentures and loans absorbed £1095; their subscription to the National Relief Fund, £110; and the dividend proposed, £6772—making a total of £7978. With increased prices for coal equal to 25 per cent. on the contracts for the ensuing twelve months, it was imperative to raise the price of gas; and notice was given of an additional 2d. per 1000 cubic feet from Lady-day last. This increase was small compared with that of several other companies; and every endeavour would be put forth to make it suffice. No one with reasonable caution would forecast the future; it was beset with the gravest uncertainties. There might be trouble in obtaining coal; there might be great inconvenience in securing the labour required. Good stocks of coal were being procured; and the Board would endeavour to meet all difficulties as they arose. He concluded by moving that the report and statement of accounts be adopted.

Mr. Samuel Cutler seconded the resolution, which was at once unanimously carried.

On the proposition of the Chairman, seconded by Mr. A. M. Paddon, a dividend was declared for the half year ended June 30 at the rate per annum of 5½ per cent. on the 5 per cent. ordinary stock, and 5 per cent. on the preference stock—both less income-tax.

The Chairman, proposing a hearty vote of thanks to the officers, said he was sure this acknowledgment was specially due to them for their services during the past half year. It had been a time of considerable anxiety in obtaining coal and other materials necessary for the manufacture of gas, and also in carrying on the work with the number of the Company's employees who had joined the army. He knew that Mr. Chapman had had an anxious time; and it was pleasing to see that, amid it all, he had devoted his attention to the improvement of the carbonizing plant, so as to obtain more gas per ton of coal, as the best means of meeting its increased cost.

Mr. A. W. Oke seconded the proposition, which was cordially agreed to.

Mr. Chapman, responding, remarked that, although it had required great energy and great earnestness on the part of those who were at home, they had been able to get along well, and, in fact, to progress, amid things which seemed so untoward.

Mr. E. L. Burton proposed a vote of thanks to the Chairman and Directors; pointing out that to be able to present so excellent a statement of accounts reflected the very highest credit upon all concerned. He was particularly pleased, as a proprietor, to see the very considerable amount the Board were devoting to the writing-off of wasting assets. This was an aspect of gas companies' business which was in certain instances very much neglected; and when one saw the Harrow Board devoting so much attention to the matter, it gave great confidence. Directors who were looking after the interests of shareholders as well as consumers, were doing the utmost they could for all concerned.

Mr. F. J. Bancroft seconded the motion; and it was heartily carried.

The Chairman, in his reply, said the Board would certainly follow out the policy which Mr. Burton had approved, of writing-down the assets. This was the easiest method of getting the capital down.

PUBLIC LIGHTING OF MANCHESTER.

Demand for Less Stringent Conditions.

At a Board of Trade inquiry held at the Manchester Town Hall last week, regarding a serious tramway accident in South Manchester which occurred the previous week-end, Mr. Percy M. Heath (the Deputy Town Clerk) stated that the Tramways Committee were working under difficulties at the present time, owing to the fact that 2000 employees had joined the Colours, and that the part of the road where the accident occurred was not illuminated as the Committee would desire. Manchester, like London, was in a state of darkness in the evening. Describing the lighting arrangements at Alexander Road South and Wilbraham Road (near the scene of the accident), the Deputy Town Clerk said the driver took another light (some 200 yards distant from the proper light) to be the one near the curve where the car left the metals and toppled over. In all the circumstances, and seeing that the character of the illumination of the streets was not now controlled by the Corporation, there was some excuse for the driver's mistaken judgment. The driver was a man of good character, good health, and good eyesight.

The driver, in evidence, stated that he had negotiated this particular curve before, but at the time of the accident it was approaching dusk. In the darkness he was not at all confident as to where the compulsory stop was, and at night he identified it by the last request stop. On the night of the accident he had not been called upon to stop, and this had misled him. Mr. J. M. M'Elroy, the General Manager of the Tramways Department, said a certain lamp that had not been lighted prior to the accident had since been lit. Drivers were allowed 16 miles an hour on this particular part of the route. In his opinion, the accident would never have occurred if the lamp on the east side had been lit instead of another one. It was a case of lighting the wrong lamp. Mr. Heath remarked that representations had been made to the Home Office by the Gas Committee for some removal of the city's present lighting restrictions.

Position of the Gas Department.

A number of complaints have lately reached the Manchester Gas Department relative to the dark streets of the city and suburbs; but at the moment of writing no sanction has reached the authorities for the better illumination of the thoroughfares, or for the removal or modification of any of the already stringent lighting restrictions. With the advent of winter it is, of course, probable that complaints will increase. It is, however, anticipated that ere long the local Watch Committee (acting for the War Office authorities) will relax the rules somewhat, and that an additional number of lamps will be lighted on important tramway routes and at dangerous corners.

THE NORTH BRITISH ASSOCIATION DINNER.

In connection with the conclusion of our report (in another column) of the proceedings at the annual meeting of the North British Association at Edinburgh last Friday week, a correspondent who was present at the dinner to which the members and their lady friends were invited by the Cowdenbeath Gas Company sends a few notes which will be of interest.

He writes: A representative company, which included a number of ladies, assembled in the evening of the day of meeting in the North British Station Hotel, Edinburgh, as the guests at dinner of the Chairman and Directors of the Cowdenbeath Gas Company. Mr. James Hutton, the Chairman of the Board, presided over the function, which was altogether successful—amply fulfilling, in every way, the expectations of both hosts and guests. In the after-dinner oratory, more than ordinary prominence was given to loyal and patriotic sentiments. In this connection, much enthusiasm was evinced in the spirited speech from Mr. J. H. Bennet, one of the Directors of Cowdenbeath Gas Company, in proposing "His Majesty's Forces;" while the neatly-expressed acknowledgment by Lieutenant-Colonel Henry O'Connor, of the Inner Forth Defences, was greatly appreciated. Mr. W. L. Sleigh, in proposing the toast of "The North British Association of Gas Managers," made allusion to the successful manner in which gas engineers throughout Scotland were meeting the inroads of a formidable rival—electricity. From their achievements in the past, the gas engineers in Scotland and throughout Great Britain had, he said, demonstrated the possibilities and potentialities of the product in which they were interested. He was an optimist in these days; and he thought the development of the gas industry was bound to continue. In acknowledging the toast, the President of the Association (Mr. J. B. Scott) touched on a few points of interest to the members. The Association, he said, was growing in influence and importance; and in the near future they might have to consider the possibility of a two days' meeting, so as to overtake, discuss, and keep abreast of their business. Gas managers were at all times ready to render mutual aid to one another in situations of difficulty and perplexity; but the primary object of their annual meetings was so to disseminate knowledge that it would be for the direct benefit of the gas consumers. Touching upon the important place which Scotland took in the gas engineering profession, Mr. Scott mentioned incidentally that William Murdoch, of gas lighting fame, was also the inventor of the first motor-car which was propelled by steam. In the course of his speech, the President eloquently appealed for funds for the motor ambulance waggon which it is proposed that the Association should be responsible for, and present to the Scottish Section of the British Red Cross Society. Mr. Alex Masterton, of Edinburgh, who gave the toast of "The Cowdenbeath Gas Company," made complimentary reference to the progress of the gas undertaking in this important district of Fifeshire, and attributed the success achieved to the combined efforts and skill of the Directors and their Manager. The Chairman briefly replied.

FACTORY AND WORKSHOP LIGHTING.

Appendices to the First Report of the Committee.

The conclusions and recommendations contained in the first report of the Home Office Departmental Committee on Lighting in Factories and Workshops were published in last week's "Journal" [p. 524]; and an indication may now be given of the contents of some of the series of seventeen appendices by which the report is accompanied.

At the beginning of the inquiry, a circular-letter was sent out by the Committee to 77 trade associations connected with the limited number of industries to which the Committee were for the time being confining their investigations; and from them 31 replies were received. This letter asked for any assistance it might be possible to give to the work of the Committee; and as an indication of the kind of evidence required, the following points were enumerated: (1) The possibility of defining and establishing a standard or standards of adequate illumination suitable for the various operations and processes in the trade represented by particular associations. (2) The classification of processes in relation to the illumination required. (3) The enumeration of the various processes in which specially good illumination is desirable, and information as to means of securing it. (4) Examples of processes presenting special difficulties in respect of efficient lighting, owing to the relative positions of the work and of the light-sources, or for other reasons. (5) Particulars of the methods of illumination in general use, with details of special systems which have been adopted for special processes. (6) The relative merits of daylight and artificial illumination, and the extent to which the latter is used, depending on the usual period of employment in the industry represented by the particular association.

Inspectors of Factories were also requested to forward notes regarding any point that might be of interest to the Committee. For instance: (1) Processes requiring exceptionally good light, by reason of the fineness of work, colour of material, or other circumstance; and the arrangements made to meet this. (2) Processes in which there is exceptional exposure to glare, and for what reason. (3) Processes in which the lighting is generally inadequate. (4) Examples of special means of lighting, or of protection from glare, and their efficiency. In response, reports were received from 30 districts, out of a total of 51. The summarized replies show a long list of processes requiring exceptionally good light by reason of the fineness of the work; several on account of the colour of the material; laundries, bakeries, wool-sorting and manipulation of dangerous wools and hides, to ensure cleanliness and good sanitary conditions; and dry-cleaning, metal-box making, and iron-foundries, for the avoidance of accidents. Among the processes in which there is exceptional exposure to glare, from one cause or another, are mentioned the retort-houses of gas-works, burning-off in mantle factories, electric glow-lamp works, carbide of calcium factories, oxy-acetylene welding and cutting, electrical welding, and the generation of electricity.

Lighting Requirements in Force.

In a section dealing with the requirements as to lighting of factories, schools, and other buildings in force in the United Kingdom, it is stated, referring first to factories, that no general provisions in respect of lighting of factories and workshops [analogous to those in the matter of temperature and ventilation] occur in the Factory Acts. The only reference to the subject is found in the Factory Act of 1901, section 101 (4), which specifies adequate lighting among the conditions on which the local authority must be satisfied before an underground bakehouse is certified as suitable for use. Under section 79 of the Act of 1901, the Secretary of State has power to make regulations for certain trades which have been certified by him to be dangerous. These regulations, after conforming to a certain procedure, eventually attain the force of statutory enactments. Some twenty codes of regulations exist, five of which contain references to lighting. They deal respectively with docks, the use of locomotives, &c., on premises under the Factory Act, vitreous enamelling of metal and glass, generation, &c., of electrical energy, and manufacture and decoration of pottery.

In connection with primary and secondary schools, the regulations in force state that the colouring of the walls and ceilings and of all fittings should be carefully considered as affecting the light. This point, and the size and position of the windows, are specially important in their bearing on the eyesight of the children.

It is pointed out that the following reference to lighting occurs in the report of the Departmental Committee appointed to inquire into the machinery and engineering staffs at Poor-Law Institutions: The number of institutions where gas is produced on the premises is small. Those where electricity is generated are more numerous; but as a rule light is obtained from a public supply. Electric lighting is generally considered to have advantages over gas lighting for institutions; but a saving in cost for illuminating purposes alone is not usually counted among these advantages. Evidence was, however, submitted to the Committee of economies effected in the cost of lighting by substituting electricity for gas. It was not contended that, light for light, electricity was cheaper. The saving was attributed to the readier facilities for controlling the use of electricity. It appears to the Committee, however, that much more care can be exercised in controlling the consumption of gas than is at present often the case, and that sufficient advantage has not been taken of the opportunities of economizing by the use of incandescent mantles. On the whole, it does not seem to them that there is adequate evidence to justify the substitution of electricity for gas at institutions where gas is already in use. At new institutions, the question is more open, and depends largely upon local conditions.

A section follows on the requirements as to lighting of factories and schools in force in certain foreign countries. Generally, it is laid down that the lighting shall be "efficient" or "adequate." In Holland, however, there are some definite figures quoted. A young person or a woman may not be employed in a factory or workshop engaged on certain specified industries unless the illumination on the place of work amounts to at least 30 Hefner units at a distance of 1 metre [equivalent to about 3 foot-candles], or any other kind of work which requires good light, unless the illumination on the place of work amounts to at least 20 Hefner units at a distance of 1 metre [equivalent to about 2 foot-candles]. In addition to the general requirements quoted, special provision as regards lighting has been made for particular industries. Added to the general requirement of adequate lighting, there is in Maryland the following provision: "Any room or apartment . . . wherein, if of less superficial area than 500 square feet, any artificial light shall be habitually used between the hours of 8 a.m. and 4 p.m. . . . shall be deemed to be a place involving danger to the public health."

In regard to the lighting of national schools in Lower Austria, it is stated that, for the general artificial illumination of class-rooms the use of diffused lighting reflected from the ceiling is recommended as the best. All hanging lamps must be fitted with appliances screening the lights from the eyes. The sources of light must be fixed at least 0·5 metre (20 inches) away from the heads of the pupils when reading or writing. The illumination must be sufficient to enable "diamond" type to be easily read by a normal eye at a distance of 0·5 metre, corresponding to a minimum illumination of 10 normal metre-candles [about 1 foot-candle]. It is recommended in Belgium, in connection with primary schools, that, where artificial light is used, care must be taken that "noxious products of combustion" are removed by placing above the light-sources pipes connected with the central flue, and arranged so as to expedite the ventilation. A distance of about 1·4 metres (4½ feet) should be maintained between the desks and the reflectors, to protect the heads of the scholars from excessive heat.

There are no special regulations for the artificial lighting of class-rooms in Denmark; but there have always been definite rules which are observed for the arrangements in this connection. In 1898 and the two following years, incandescent gas-lamps were introduced into all schools, both old and new. Four of these, of 75-candle power each, were provided for a class-room of 47 square metres floor space [487 square feet], corresponding to a proportion of 6·3-candle power per square metre [0·62-candle power per square foot]. The lamps were all furnished with shallow conical reflectors and eye-shades. This system is still in use in all schools built before 1908; but since that date, electric light has been installed in all new schools. In France, illumination derived from diffused electric light reflected from the ceiling, is recommended. It is found that a light-source of about 25-candle power at a distance of 1 metre is sufficient for reading and writing in class-rooms in Sweden. All lamps must be so placed that the pupils are not compelled to look either straight at them or directly past them. If arc lamps are used, indirect lighting should be adopted. It is found for artificial lighting in rooms used for industrial instruction that incandescent gas possesses the disadvantage that the lighting power of the mantle falls off very quickly, owing to the fine sawdust present in the air settling partly on the mantle and partly in the orifices of the burner.

(*To be continued.*)

GAS WORKERS AND WAR BADGES.

Some remarks in the current number of the "Birmingham Gas Department Magazine," on the subject of gas workers and war badges, supplement a statement made in the same publication a month ago [*ante*, p. 357], as to the issue of war badges to Gas Department employees; it being then mentioned that the badges were to be provided by the department, and not by the Government. The following information is now given by the "Magazine."

A few days after the issue of the "Magazine," we understand the department received an intimation from the Ministry of Munitions that official badges would be provided for certain classes of workmen employed by the Department; and these are now being issued. Authority has been received for badges to be given only to skilled and semi-skilled indispensable workmen employed in the supply of gas for power and heat for munitions factories, and in the extraction of toluol for high explosives. The Government regulations distinctly prohibit the issue of badges to men usually classed as "unskilled," or to men engaged on purely private or non-war work. This is regrettable, as, apart from the invidious distinction which has consequently to be drawn between men engaged on the same works, the "unskilled" gas-works labour is, under the present abnormal circumstances, as difficult to obtain as the skilled and semi-skilled, and is equally as essential for the carrying on of the works.

DEWSBURY MUNICIPAL UNDERTAKINGS.

The abstract of accounts of the Dewsbury Corporation, for the year ended March 31 last, compiled by the Borough Accountant (Mr. John Hutchinson), gives, of course, particulars relating to the gas and other reproductive undertakings.

It seems that on the gas-works there was a gross profit of £13,717, out of which over £9000 was paid in respect of sinking fund and interest. The net surplus was £4413 for the year, and £7993 had been brought forward, making a total of £12,406, from which £9700 was transferred in aid of the borough rate and £100 was granted to the Public Library Committee. There then remained a credit balance of £2606, a decrease of £5387. The balance-sheet of the undertaking gives the surplus of assets over liabilities as £114,786. Last year sales of gas produced £32,154 (an increase of £1000 on the preceding twelve months); but residual products went down by £1600—from £12,654 to £10,938. Consumers of gas through ordinary meters paid the Corporation £23,884; and £8463 was received for gas supplied through slot meters.

The gross profits on the electricity works were £6364. After adding £984 brought forward and some smaller items, there was available £7355, out of which £4500 went to sinking fund and interest, £1000 to reserve fund, and £500 to the renewals fund. The net result of the twelve months' working was that the reserve and renewals funds were strengthened to the extent of £1500, and that the credit balance on revenue account was increased by £363, from £984 to £1347. On capital account, the estimated surplus of assets over liabilities is now £40,317.

After paying for water received, and the expenses on distribution, the water department yielded a gross surplus of £16,034, to which there was added £2072 brought forward from the previous year, making a total of £18,106. The receipts included £4800, the borough's three-fourths share of the profits of the Dewsbury and Heckmondwike Water Board. Nearly £13,500 had to be paid into the sinking fund and for interest, and £1449 was given in relief of rates, But after all this had been done, the credit balance was increased by £1140, to £3212. The sales of water for domestic purposes produced £11,361, and for trade purposes £13,126. The capital account gives the assets as £185,564 in excess of liabilities.

DISPUTE AS TO A WATER SUPPLY IN BULK.

Second Day's Proceedings of the Morpeth and Tynemouth Arbitration.

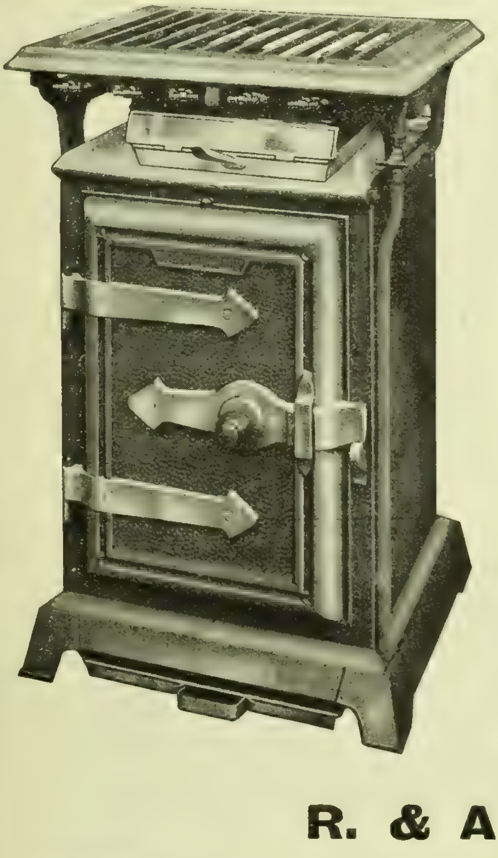
A report has already been given in the "JOURNAL" [*ante*, p. 532] of a portion of the proceedings in an arbitration which took place some time ago with reference to a dispute between the Morpeth Corporation and the Tynemouth Corporation as to the correct interpretation to be placed upon an agreement for a supply of water in bulk. Morpeth contended that they were entitled to a direct connection between their supply main and the gravitation main of the Tynemouth Corporation; and on the award being stated in the form of a special case, the Court upheld this view.

Mr. A. J. RAM, K.C., acted as Arbitrator. The Counsel engaged were Mr. HOLMAN GREGORY, K.C., and Mr. SCHOLEFIELD, for the Morpeth Corporation; and the Hon. J. D. FITZGERALD, K.C., and Mr. C. F. LOWENTHAL, for the Tynemouth Corporation.

Mr. FITZGERALD proceeded to read some correspondence when the proceedings were resumed on the second day; and at the conclusion of this,

The ARBITRATOR said: I presume it cannot be denied that if the water is given under pressure, Morpeth would get, and Tynemouth would give, a very much larger quantity per annum than if it were given not under pressure. If it is given under pressure, it will serve a very much larger area than if it is not.

Mr. FITZGERALD: It is not a question of serving the whole town. All they want is a supplementary supply. I do not think, so far as I



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can form an opinion, that it makes any difference in the quantity. They can take without pressure just as much water as they could take under pressure.

The Arbitrator: They could; but they might not have the same inducement to take it.

Mr. Holman Gregory: Not only that, but we could not use it; and therefore we could not take it.

The Arbitrator: Presumably if Tynemouth have spare water, it is to their advantage to sell it. If they have not, they are relieved from the agreement to supply water at all through this main.

Mr. Fitzgerald, addressing the Arbitrator for Tynemouth, said the question here was really one of law. The point was what the agreement meant; and most of the evidence given was entirely outside this. He understood Morpeth to set up a double contention. They said, firstly, that they were entitled to have the water delivered under pressure from the gravitation main into their service main; and, secondly, that they were not required to specify any quantity of water or any time during which they would take it. The only limit was the 20 gallons per day per head of the population. The first observation that he had to make was that this supply was a supply in bulk, and nothing else. It was given under section 37 of the Tynemouth Corporation Act of 1898, in which nothing at all was said about pressure. There being no obligation in the section to deliver a supply at any pressure, if such an obligation was to be placed upon the Corporation it must be by express agreement. There was, however, not a word in the agreement about supply by pressure. If such a supply had been intended, nothing would have been more simple than to have so stated it in the agreement. His second observation was that, according to the decision given by Mr. Justice Swinfen-Eady in the Dearne Valley case, a supply in bulk did not mean a supply under pressure; but it did mean a supply given by an equable flow throughout the whole of the 24 hours. These points were expressly decided in the Dearne Valley case; and he was rather surprised that his learned friend, in opening, made no allusion to this decision. As had been remarked already, the Tynemouth Corporation were in possession of a supply of water larger than they required. Indeed, they had surplus water at the present time running to waste. It was therefore to their interest to sell it; and there was no ground whatever for the insinuation that this was an attempt on the part of Tynemouth to get out of the agreement because they did not want to give a supply. What they declined to do was to furnish a supply according to a method which, in their view and in that of their advisers, they were not bound as a matter of law to give, and which was from a water-works point of view objectionable. Which witnesses were right and which were wrong was, however, entirely beside the question; for even if Tynemouth were quite unreasonable about the matter, it would be immaterial to the construction of the agreement. The agreement was in perfectly plain and simple English, and entitled Morpeth to a supply of water to be taken from the gravitation main at some place on Morpeth Common—the Tynemouth Corporation to make the connection, at the cost of Morpeth. Tynemouth had always been willing to give a supply from this main; and he wished to relieve them of any imputation of having acted unreasonably or from any indirect motive in the matter. He then proceeded to deal with the agreements made with other authorities for bulk supplies off the main.

Mr. Holman Gregory pointed out, however, that in those cases the price was 4d. per 1000 gallons; whereas Morpeth paid 6d., because they had the option of taking the water when they liked.

Mr. Fitzgerald (continuing) argued that, in addition to the point about pressure, the Arbitrator should rule that Morpeth were bound to state what quantity of water they required and for what period.

Mr. Holman Gregory: If my clients consent to this being dealt with now, it ought not in any way to bear upon your decision as to who should pay the cost of these proceedings. It is a new point altogether. I agree you should give a decision as to what should properly be the contents of the notice required by the terms of the agreement.

Mr. Fitzgerald said it would be unreasonable that Tynemouth should simply be given a notice to require water without specifying the quantity and period of the bulk supply. In the case of the *Wombwell Urban District Council v. Dearne Valley Water Company*,* the Council were entitled to get a supply in bulk from the Company; and they raised the two questions just discussed. The substantial provision of the agreement was: "The meter shall be placed, and the water delivered and taken, at a point along the Company's mains to be mutually agreed upon between the Company and the Council." The Court held that the Company were not bound to deliver the water at greater pressure than would make it reach the point of delivery; and that the Council were bound to take it regularly, and store in their reservoirs any surplus against future needs. The circumstances of the cases seemed to be practically the same; and the decision given was of general effect with regard to a supply in bulk. In conclusion, he pointed out that he had stated at an early period of the hearing that he would ask the Arbitrator to state his award in the form of a special case, as there was a substantial question of law involved.

Mr. Holman Gregory, in reply, said it was perfectly clear that the facts of the Dearne Valley case differed entirely from those of the present one. The outstanding feature which distinguished the Dearne Valley case from the matter now before them was that when the agreement was entered into there was no question of water being delivered under pressure, because the Special Act exempted the Company from supplying under pressure. There was a special provision that the water supplied under it need not be constantly laid on under pressure; and at the time the contract was made between the parties, nothing was said as to how the water was to be delivered. Later there was a Provisional Order which stipulated that the supply for domestic purposes

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* An extended report of the case to which Counsel referred—that of the *Wombwell Urban District Council v. Dearne Valley Water Company*—will be found in Vol. XCVIII. of the "Journal," pp. 595, 751, and 825.

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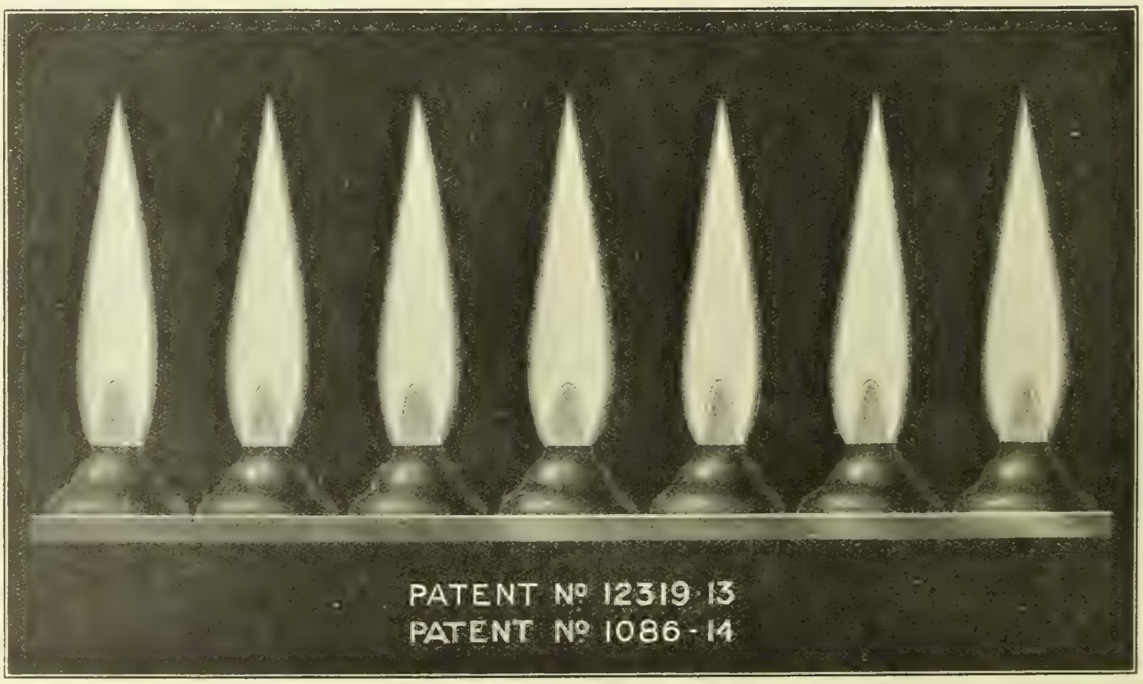

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to the Company's own district was to be under pressure; and as the water was going through the main under pressure, the Wombwell Council said they were entitled to have it under pressure. The Judge, however, said the Order did not interfere with the agreement which the parties arrived at between themselves before the Order was made, because the Order only said that the water had to be delivered under pressure for domestic purposes in the Company's own district. As to the main contention before the Arbitrator, the Morpeth Corporation were contending that they were entitled to a connection which would give them the benefit of the water in the gravitation main as it then existed. He was not maintaining that Tynemouth were bound to deliver at any particular pressure, but that Morpeth were entitled to the water at a definite spot, with all its virtues and all its detriments. It must not be taken that he was assenting to the Arbitrator stating his award in the form of a special case. He desired to leave open any points that he might be in a position to take upon the matter.

This concluded the hearing before the Arbitrator.

Subsequently, the special case stated by Mr. Ram came before Mr. Justice ATKIN, sitting in the King's Bench Division of the High Court of Justice. Mr. HOLMAN GREGORY, K.C., and Mr. J. SCHOLEFIELD again represented Morpeth; while Mr. SCOTT FOX, K.C., and Mr. C. F. LOWENTHAL appeared for Tynemouth.

The case which was argued, after reciting the facts, as agreed by Counsel, set forth the alternative forms of the award, and declared that the costs of the reference and the award should follow the decision of the Court.

Mr. HOLMAN GREGORY emphasized the importance to Morpeth of receiving the water under the pressure at which it would naturally leave the gravitation main.

Mr. SCOTT FOX, in replying, maintained that the gist of the matter in dispute was whether the Morpeth Corporation were to take the water, or the Tynemouth Corporation were to deliver it.

His LORDSHIP, in giving his decision, said he thought the Morpeth Corporation were entitled to a direct connection between their supply main and the gravitation main of the Tynemouth Corporation, at a place agreed upon.

Lincoln Gas-Workers' Wages.—There has been a good deal of agitation at Lincoln as to wages; it being reported at a meeting of the Council last Tuesday that an application had been made to the Gas Committee on behalf of the unskilled hands employed at the Bracebridge works, with the result that wages had been increased to 6d. per hour for a week of 54 hours. The arrangement is that they shall be paid only for the time actually worked, and that the payment of wages during holidays should be discontinued.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The price of gas to ordinary consumers in Aberdeen has been fixed at 2s. 6d. per 1000 cubic feet—3d. less than last year. The charge for gas-engines is to be 2s. 2d. per 1000 cubic feet—an increase of 3d. The Electricity Committee recommended that the charge for electricity be fixed at the same rate as last year, with the addition of 15 per cent.; but the Council resolved to remit the matter back to the Committee for further consideration.

At a meeting of the Greenock Gas Committee last week, the financial statement for the past year was submitted and estimates for the current year were disposed of. The surplus on the year's working was £1582. The estimated deficiency for the coming year, £7000, was to be accounted for mainly by the increased price of coal. In order to meet this, it was decided to recommend that the ordinary lighting rate be increased from 2s. 6d. to 2s. 11d. per 1000 cubic feet, and the slot meter rate to 2s. 10d.; the power rate remaining at 2s. 3d. This is expected to result in a net balance of £130.

The offer of the Peterhead Town Council to settle a gas-workers' wages dispute by arbitration has been agreed to by the Union officials, provided no undue delay is experienced in the settlement, and that retrospective consideration be given to the claims of the men. Attention having been called to the need for economizing, and in view of the large decrease in the manufacture of gas and the falling off in the sale of residuals, it was unanimously agreed that the Manager should combine with his own duties that of the foreman also, and that the latter's services be meantime dispensed with.

An explosion occurred a few evenings ago in Glasgow, as the result of an accumulation of gas in five manholes. An escape of gas had been detected in the manholes, which are situated in High Street; and before the explosion a gang of workmen had been engaged in locating the source. For a time the tramway service was suspended. As the streets were crowded at the time, the affair created some alarm; but fortunately no one was injured.

The Glasgow Corporation have had a report by the Parliamentary Bills Committee to the effect that in connection with the proposed Corporation Water Order, which provides for the inclusion of the River Turk in the Loch Katrine water area, arrangements have been made whereby the Earl of Moray is to receive £30,250, and the Crown authorities £2250, in full discharge of their claims at the Royal Forest of Glen Finlas. A report on the scheme states that a supply of at least 15 million gallons daily, over and above compensation water, will be obtained, and for this quantity the estimated cost of the works is moderate. In the compensation to be paid—viz., £32,500—is embraced the ground for the dam, reservoir, buildings, wayleaves, &c. The claims of the agricultural tenants have still to be met.

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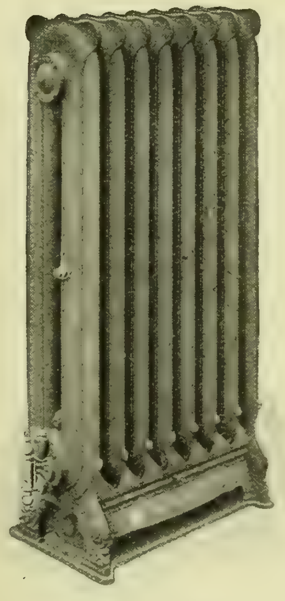

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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Sept.* 13.

There is rather more inquiry for pitch, but otherwise there is nothing particular to record in the tar products market. Values generally remain without change at the figures last reported.

The quotation for sulphate of ammonia remains unaltered at £14 8s. 9d. per ton net, into buyers' bags, at makers' works, for 25 per cent. quality.

Tar Products in the Provinces.

Sept. 13.

There is little alteration in the market for tar products. Pitch is still very difficult to sell, and at the present moment buyers abroad will not pay the prices being asked on this side. Solvent and heavy naphthas are in very good demand. Creosote is quiet; and there are some quantities offering at fair prices without finding buyers.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 3d. to 25s. 3d. Pitch, East Coast, 21s. 6d. to 22s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. Clyde. Benzol, 90 per cent., North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, $2\frac{15}{16}$d. to 3d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 5d. to 3s. 6d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

Liverpool, *Sept.* 11.

In the early part of the week the market remained very firm, but towards the close the tone has become quieter, and values have receded slightly. The volume of business has not been large, as, on the one hand, purchasers have been rather indifferent, and, on the other hand, makers have not given way willingly. To-day's quotations are £14 10s. per ton f.o.b. Hull, £14 12s. 6d. f.o.b. Liverpool, and £14 15s. f.o.b. Leith. Producers have maintained a firm attitude for future delivery, and continued to demand a premium of 5s. to 10s. per ton on prompt prices for October-March, but no first-hand transactions have been reported.

Nitrate of Soda.

This market has remained very firm, and the quotations on spot are now 13s. 9d. per cwt. for ordinary, and 14s. 3d. for refined quality.

Sulphate of Ammonia.

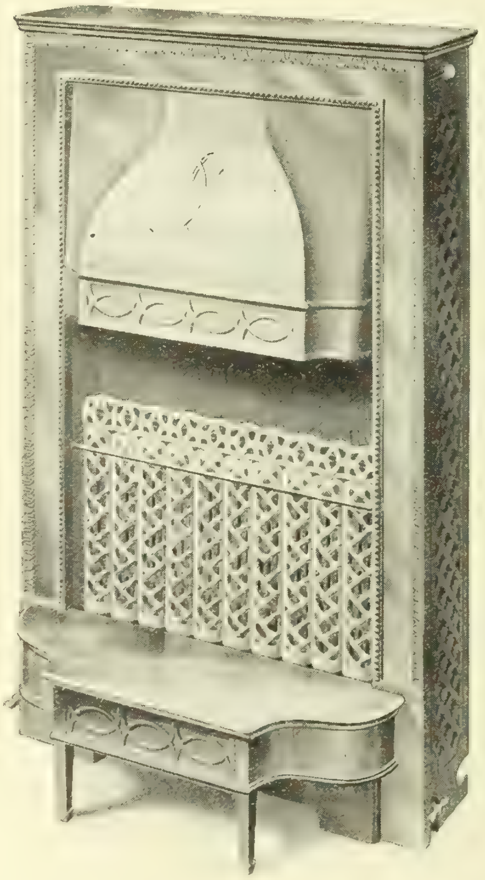
From another source it is stated that the market seems to have steadied itself throughout the past week, and prices have improved slightly. Outside London, makes are quoted at £14; Hull, £14 7s. 6d. to £14 10s.; Liverpool, £14 10s. to £14 12s. 6d.; Leith, £14 12s. 6d. to £14 15s.; Middlesbrough, £14 10s.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is still quiet, owing to the lack of ready steamers and the restriction of coal licences, except to France. That country has increased its demand for fuel, and there has been some easing of the conditions of licences to it. In the steam coal trade, the tone is quiet, and prices are again weak. Best Northumbrian steam coals are from 18s. to 18s. 6d. per ton f.o.b.; for second-class steams, the current quotation is about 16s. to 16s. 9d. per ton; and steam smalls are rather lower at 12s. 3d. to 14s. per ton. Production is full for all the needs; but for ready tonnage the demands seem to vary a good deal. In the gas coal trade, the requirements appear to be steadily increasing—the demand being good for the south of England and for France. Best Durham gas coals are quiet, at from 19s. to 19s. 6d. per ton f.o.b.; second-class qualities are little altered in value at 17s. to 17s. 6d. per ton; and "Wear Specials" are relatively steady at 21s. 6d. to 22s. per ton. Rates of freight on gas coals show more variation—from 7s. to 8s. 6d.; the former rate, however, being that of a "Government boat." There is little doing in contracts ahead at present, as some buyers seem to hope for lower prices before the winter demand reaches its fullest, though there is still some further reduction of the miners in the Durham county by enlistment. Coal shipments from the Tyne now begin to show some increase when contrasted with the diminished exports a year ago. Coke is on the whole steady, with normal shipments from the Tyne. Good gas coke is from 28s. 6d. to 29s. 6d. per ton f.o.b. in the Tyne.

War Bonus Question at Oldham.—The war bonus question at Oldham was considered *in camera* at a meeting of the Town Council last Wednesday. At the close of the meeting, the Mayor stated that letters had been received from Mr. J. R. Clynes, M.P. (the General Secretary of the Gas-Workers' Union), and from the District Secretary of the Municipal Employees' Association, in furtherance of the men's claims. The Council, he said, re-affirmed their decision to grant an advance of 2s. per week to all adult employees who were in receipt of 28s. per week or less, and 1s. to those receiving 29s.—confining the increase to those whose wages with the advance will not exceed 30s. per week. The letters received from the Unions both took the same line of argument, that while 2s. per week extra might prove acceptable to employees not receiving 30s., those getting more than 30s. should also have a war bonus.



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Winchester Water and Gas Company.

Moving the adoption of the report [*ante*, p. 469] and accounts at the half-yearly meeting of the Company, the Chairman (Mr. J. C. Warner) remarked that the six months ended June had been one of the most anxious periods the management had experienced since the commencement of the undertaking. Apart from the general trouble caused by the war, they had had a large amount of extra work thrown upon them. The result of this extra work was shown in their report in two ways. They had had a large increase in revenue, both from the sales of gas and water, and an equal and corresponding increased expenditure in producing the gas and in pumping and distributing the water. It must be obvious to the shareholders that the profit they made from the sale of gas was mainly dependent on the price of coal. Unfortunately, as all of them knew, the price of coal had considerably increased the past few months. With regard to water, he would like to say that, owing to the establishment of the military camps in the neighbourhood of Winchester, and also to the fact that during a part of the period under review there was a large number of troops billeted in private houses in the city, the demand on their resources for the supply of water had been greater than ever before. He thought in this respect the citizens were much indebted to the management of the Company, because unless the Company had been able to supply the water the establishment of these camps could not have taken place in the locality. Another anxiety which had presented itself had been the damage their mains and services had sustained from the heavy traction traffic through the streets of Winchester. They had had to make provision for repairs in this respect, which would be carried out when labour was available. Shortage of labour, too, had rendered it impossible to carry out the ordinary every-day repairs, to keep the plant in full and efficient working condition. They had, therefore, out of the earnings of the half year, which were larger than usual, made provision to meet the expenditure later on. Great anxiety had been caused the Engineer (Mr. H. C. Head), and other officials of the Company, by the extra work and trouble imposed upon them; but both shareholders and consumers were indebted to Mr. Head and his staff for the way in which the business had been conducted. The report was adopted; and a dividend of 4 per cent. per annum on the preference stock and 4½ per cent. on the consolidated ordinary stock was declared.

Gas for Power at Ballymena.—At a meeting of the Ballymena Urban Council, letters were read asking for re-consideration of a decision in regard to the cost of gas for power; the contention being that there should be a difference in the charge for this purpose and that for lighting. Local firms, on this understanding, had installed expensive machinery, and felt that they were hard hit by the recent change. The Chairman (Mr. S. Hood, J.P.) said it was thought that a uniform rate of 4s. 7d. per 1000 cubic feet would be equitable; but if a slight reduction could be made for power, there would be no objection. It was eventually arranged to leave the matter to a Committee.

Gas Worker Refused a "Leaving Certificate."

During proceedings at the Sheffield Munitions Court last week—at which Sir William Clegg sat as Adjudicator, Mr. J. B. Bardsley represented the Employers' Panel, and Mr. H. A. Stone the Men's Panel—some of the cases showed that the applicants for "leaving certificates" desired to change their employment solely to get higher wages elsewhere; and in each instance the Court refused to make an order for a certificate to be given. In one case, John A. Madeley, a fitter's labourer, who was in the employ of the Sheffield United Gas Company, gave a week's notice, and left his employment, with the object of entering the service of Messrs. Thomas Firth and Sons, at a wage, including war bonus, 5s. in advance of what he was receiving from the Gas Company. He gave a week's notice to his foreman, and nothing was said to him at the time. On behalf of the Gas Company, it was stated that they wanted men, and could not do without any of their present staff. The Company's concern was an essential factor in the work of munitions; for they supplied a great deal of the power to the munition works. Sir William Clegg, when announcing that a certificate could not be granted, said it would have probably saved a good deal of trouble if the foreman who received the notice from the applicant had told him that they could not possibly do without him.

A Dutch Mantle "Made in England."—At the Leeds Police Court last Tuesday, the Direct Supply Company, of Merrion Street, were fined £3 for having sold an incandescent gas mantle of Dutch manufacture, the cover of which bore the inscription "Made in England." The Magistrate took the view that a mistake had been made.

Public Lighting Economy at Stafford.—Considering the question of effecting economy in public administration, the Stafford Town Council, on the recommendation of a Joint Committee, decided that the extinguishing of all public gas-lamps should commence at eleven o'clock in the evening, and that eight of the all-night electric lamps should be discontinued. In consideration of this reduced lighting, the Gas and Electricity Committee agreed to a reduction in the charge for public lighting of £350 a year.

Tamworth Gas Company.—At the annual meeting of the Company, the Directors reported that the accounts for the year ended June 30 showed a surplus on the working of £2181. The coal contracts for the year on which they were now entering had had to be made at prices greatly exceeding those paid for the past twelve months. They considered it neceessary to purchase and store greatly increased stocks of coal. Owing to these and other circumstances, the Directors had been reluctantly compelled to temporarily increase the prices charged for gas 5d. per 1000 cubic feet, as from the meter-taking at June 30. A dividend for the half year to Dec. 31 at the rate of 10 per cent. per annum on the new shares, less income-tax, having been paid, the Directors recommended that a similar dividend be paid for the six months ended June 30.

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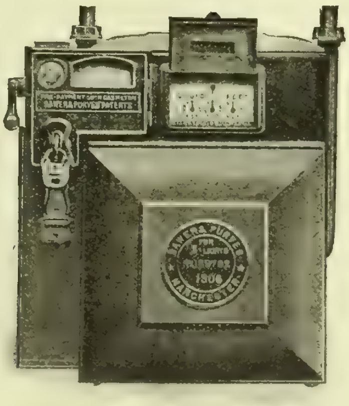

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Price of Gas at Newtownards.—The Newtownards Urban Council have decided to increase the price of gas for all purposes 5d. per 1000 cubic feet from Oct. 1. The Chairman (Mr. T. R. Lavery, J.P.), at the Council meeting, said, even with this increase, Newtownards would have the cheapest gas of any inland town in Ireland.

New Gasholders at Kirkby.—At last Tuesday's meeting of the Kirkby-in-Ashfield Urban District Council, it was stated that a mortgage had been effected for raising £5500 to defray the cost of a new gasholder. The Works Manager (Mr. G. M. Gribble) reported upon the Government suggestions regarding the manufacture of toluol; but it was decided, upon the information before the Committee, that no action should be taken.

British Coalite Company.—The Secretary of the British Coalite Company, Limited, states that the option to purchase part of the freehold properties belonging to the Company has now been exercised by the holders; and, on completion of the necessary formalities, the outstanding first mortgage debentures of the Company will be paid off at the rate of £105 per cent. The £75,000 second debenture stock of the Company thus becomes a first charge on the Company's property.

Ballymena Gas Undertaking.—Messrs. Martin, Shaw, Leslie, and Shaw have reported on the audit of the Ballymena gas accounts. The total revenue for the year was £6247, and the expenditure £5298, leaving a trading profit of £949. Deducting from this interest on loans, left a surplus of £194. The gas used by private consumers for lighting and heating amounted to 20,142,800 cubic feet, which, after deduction of discount, realized £3948—an average of 3s. 10·04d. per 1000 cubic feet, compared with 3s. 11d. the previous year.

Australian Gas Light Company (Sydney).—During the half year ended June 30, net profits amounting to £52,609 were earned by the Company; and the sum available for allocation is £64,154, of which £52,275 is absorbed by dividends at the rates of 7 per cent. on the "A" and "B" shares, and 6 per cent. on the "C" shares, leaving £11,880 to be carried forward. In consequence of the price of gas having been increased in November last, the dividend has been reduced, in order to comply with the New South Wales Gas Act, 1912. It is the intention of the Directors to increase the capital by issuing 50,000 "C" shares.

Milnrow Gas Company.—At the half-yearly meeting of the Company, the report and balance sheet were adopted, and the usual dividends declared. The report showed that the profit earned during the first six months of the present year was the largest since 1903, excepting the corresponding half years of 1913 and 1914. The profit on revenue account reached £793. The dividends this half year are to be 9 per cent. on the old shares and 6 per cent. on the new ones. The balance available for dividend is £804, which compares with £867 twelve months ago. The dividends are now declared [as they also were six months ago] less income-tax, instead of free of tax. The reserve fund remains at £1300.

Dublin Lighting Control.—At last week's meeting of the Dublin Corporation, a report from the Lighting Committee recommending an amalgamation of the Committee with the Electricity Supply Committee was on the *agenda* for confirmation. The matter fell through; the necessary two-thirds of the Council not being present when the roll was called. Mr Cole (the Chairman of the Lighting Committee) said the recommendation was made on the ground of economy. The Citizens' Association were anxious for economy; but when this subject came up, members not only called out their friends, but themselves walked out of the Council Chamber. Alderman Quaid expressed the view that gas should not be exploited in the interest of the electricity enterprise.

Lewes Gas Company.—In the report which was adopted at the meeting of the Lewes Gas Company last week, it was stated that the revenue account for the six months ended June 30 showed a profit of £1507. The Directors recommended that dividends for the six months be declared at the rate of 5 per cent. upon the original capital stock and 3½ per cent. upon the additional capital stock—absorbing (after deduction of income-tax) £1329. The Chairman (Mr. M. S. Blaker, referring to coal, said the difficulties of supply had been greatly increased by the fact that the port of Newhaven, through which the bulk of their supplies used to come, was practically closed for ordinary traffic. They had been able to get through a few small cargoes, for which they were largely indebted to the ingenuity of their Manager (Mr. Edward Jones). The Directors had had under consideration for some little time the question of an increased production of gas, more especially during the winter months; and, advised by Mr. C. F. Botley, of Hastings, they had decided to instal a carburetted water-gas plant and a booster.

Government and the New Water-Main at Torquay.—The Local Government Board appear to be unable to decide whether the laying of the new water-main to supplement the supply of water to Torquay should be allowed to continue. Contracts have been entered into by the Torquay Corporation, and the work is in hand, and the Water Committee have furnished the Board with a statement of the reasons why, in their opinion, it should be continued and completed in spite of the general instruction against incurring capital expenditure on local undertakings. In reply to this, the Board wrote that they were of opinion that the work should be stopped as far as possible, and asked for a statement showing the total liabilities to be met on the ceasing of the work. It was reported at a meeting of the Town Council last Tuesday that the Water Engineer (Mr. S. C. Chapman) had prepared a statement showing the amount for which the Council were liable to the contractors for pipes and for work done and to be done, and also of the money paid and due. He also reported the terms on which the contractors were prepared to stop the work. The Water Committee were of opinion that the Local Government Board should be again approached on the matter; and a special report was prepared for submission to the Board. The Town Clerk and Water Engineer were instructed to interview the Board on behalf of the Council. It was stated that, since the Committee met, an Inspector from the Local Government Board offices had visited Torquay, and had an interview with the officials; but the result had not transpired, and the work was still going on.

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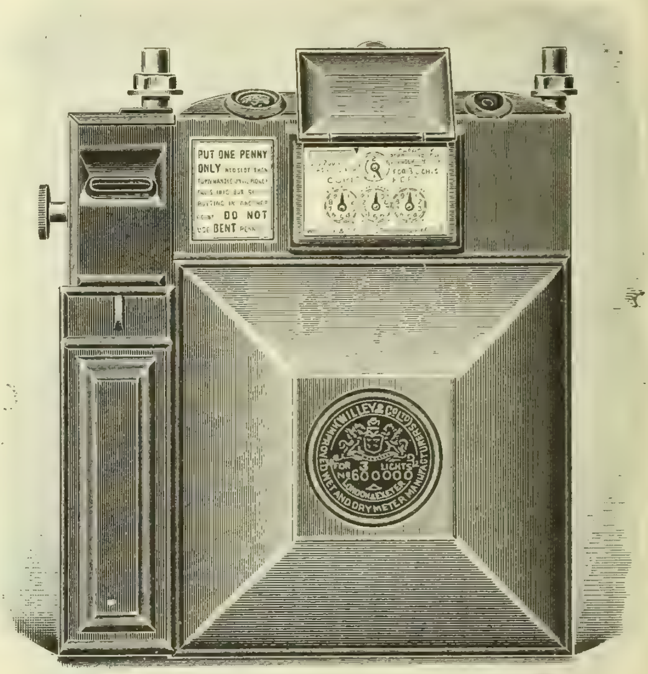

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Destructive Fires at Berlin Gas-Works.—According to the Paris "Journal" a series of mysterious outbreaks of fire has recently occurred in Berlin, a large quantity of goods of prime necessity being destroyed on each occasion. Within a week fires have taken place at a number of gas-works, destroying several hundred thousand tons of coal. The Lindenstrasse quarter of the capital had to be inundated to prevent the spread of fire, and property has suffered considerably in consequence.

Explosion at Weston-super-Mare Gas-Works.—On Friday evening, a Bristol paper states, a good deal of excitement was caused among residents at Weston-super-Mare by an explosion accompanied by a bright flash; it being thought that an air raid was being made on the town. The trouble, however, proved to be in connection with a small holder used for the water-gas plant at the Gas Company's old works. Damage was sustained by the roof of the purifier-house; but there was no case of personal injury.

Maryborough (Queensland) Gas Company, Limited.—The report of the Company for the past half year states that the profits, after making provision for bad and doubtful debts, repairs and renewals, depreciation, working expenses, wear and tear, and other charges, including the balance brought forward, amounted to £1240, from which the Directors recommended the payment of the usual dividend of 6 per cent. per annum, free of income-tax. This would absorb £990, and leave £250 to be carried forward.

Plymouth Water Profits.—A financial statement presented to the Plymouth Corporation Water Committee shows that for the year ended March 31 last the gross profit of the Plymouth undertaking was £25,302, and of the Devonport works £19,230. From the profit on the Plymouth undertaking there has to be deducted £9534 for dividends and interest, £2002 for income-tax, and £4911 for redemption of stock and mortgages—leaving a balance of £8849 as net profit to be carried to the borough fund. In the case of the Devonport works, £11,686 is required for interest, £3835 for redemption of loans, and £332 for income-tax—leaving £3382 as net profit, which it is proposed to carry to the reserve fund.

Bradford New Water-Works Stopped.—The Town Clerk (Mr. Frederick Stevens) has received a communication from the Local Government Board intimating, practically, that the works now proceeding in connection with the water undertaking of the Bradford Corporation must be stopped. An Inspector of the Board recently visited Bradford, for the purpose of inquiring into the City Council's contention that the completion of the duplication of the pipe-line from the Nidd Valley—the principal work involved—was essential to the industry and welfare of the city.

Scarborough Public Lighting Charge.—A curious position has, says the "Leeds Mercury," arisen with regard to the street lighting of Scarborough. Owing to the restriction of lighting, the quantity of gas taken by the Corporation from the Gas Company has, it has been reported to the Corporation, fallen below the minimum amount which entitles the Council to discount. As a matter of fact, had a considerable quantity more been used it would have meant a less cost to the Corporation than losing the discount will mean. The matter has been referred to the Chairman of the Lamps Sub-Committee (Mr. Fletcher) and the Chairman of the Finance Committee (Alderman Rowntree), with a view to seeing whether any arrangements can be come to with the Company.

APPLICATIONS FOR LETTERS PATENT.

12,508.—GALE, A. R., "Gas-turbines." Aug. 31.

12,595.—ANTROBUS, W., "Production of water and illuminating gas and bye-products." Sept. 2.

12,603.—ALEXANDER, J., "Gas-producers." Sept. 2.

12,608.—PROCKTER, F. M., and SWINDIN, N., "Treating gases with liquids." Sept. 2.

12,676.—MOUNTAIN, H., and WORSFOLD, J., "Gas cooking apparatus." Sept. 3.

12,695.—HALL, I., "Burning gas" Sept. 4.

12,714.—LEYSHON, A. D., "Stopcocks." Sept. 4.

GAS COMPANIES IN THE STOCK EXCHANGE.

The week just closed on the Stock Exchange was a quiet one, but anyhow it managed to compass a little more activity than its predecessor. The general tone, too, was decidedly firm. A cheery anticipation of appreciably improving conditions naturally engendered an indisposition to sell at existing prices; and the scarcity of stock consequent thereon had its influence in reducing business to very moderate proportions. A gratifying feature was the continued upward progress of Home Government issues; and War Loan quotations were carried up on the rising tide. Colonial issues were in good request, especially those redeemable at early dates, and the popularity of this class of security is very evident. A favourable factor was provided by the trade returns for August with their notable improvement in exports. Canadian securities advanced on a continuation of good reports in regard to harvest prospects. Home Rails made a further recovery from the persistent depression under which they had suffered. South Africans were in demand. Among the Miscellaneous group, there were several very strong lines. Conspicuous in this quarter were shipping, rubber, and oil, and those connected with armaments and warlike appliances. In the House there is some agitation in progress for a further reduction of minimum prices. To some extent this would be not unreasonable, but it is a measure needing mature consideration. Bank returns indicate that an increasing amount of gold is being withdrawn from internal circulation. It is a pity that the hands of the bankers are not strengthened by a Treasury order enabling them to resist unreasonable demands by their customers for gold. Business in the Gas Market was really quieter than ever; the aggregate of bargains recorded being only about a couple of dozen. If this be a sign that shareholders are sitting tight on their holdings, it is a good one. The Money Market was firm.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 78½, 79, ditto maximum 59⅞, ditto preference 72, 73, South Metropolitan 81. On Tuesday, Gas Light ordinary 78½, 79, 79¼, ditto maximum 59⅜, 59½, 59⅞, ditto preference 72, 73, Primitiva 2$\frac{17}{32}$. On Wednesday, Oriental 100, 100¾. On Thursday, British 37, Gas Light debenture 62. On Friday, Gas Light ordinary 78½, Primitiva 2½, ditto preference £3 10s. 6d., South Metropolitan 80. The Exchange was closed on Saturday.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING SEPT. 11.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	..
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
280,000	5	April 29	7½	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	..
50,000	10	Feb. 26	16	Bournemouth Gas and Water 10 p.c. . .	29—30	5 6 8	..
873,480	10	,,	7	B 7 p.c. .	15—15½	4 10 4	..
95,000	10	,,	6	Pref. 6 p.c.	13½—14	4 5 9	..
—	—	—	—	Deb. . .	..	—	..
380,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
830,000	,,	,,	11	Do. New . . .	204—209	5 5 3	..
50,000	,,	,,	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	91—93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	,,	,,	8	Do. A Ord. Stk. .	154—159	5 0 8	..
530,000	20	Mar. 26	12½	British	44—45	5 11 1	37
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	Do. 4½ p.c. Pref. .	4—6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	..
560,000	,,	,,	5⅓	Do. 3½ p.c. do. .	103—105	5 1 6	..
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	..
800 000	Stk.	,,	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	,,	,,	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	Derby Con. Stk. . . .	123—125	4 16 0	..
55,000	,,	—	4	Do. Deb. Stk. .	102—104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd. . . .	17½—18	5 11 1	..
6,362,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke 4 p.c. Ord. . .	98—102	4 15 6	78½—79¼
2,600,000	,,	,,	3½	3½ p.c. max. .	76—79	4 8 7	59⅜—59⅞
4,062,235	,,	,,	4	4 p.c. Con. Pref.	96—99	4 0 10	72—73
4,674,850	,,	June 11	3	3 p.c. Con. Deb.	72½—74½	4 0 6	62
130,000	,,	,,	10	10 p.c. Bonds .	..	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16¼—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c. . . .	..	—	..
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C . . .	151—154	5 2 4	..
65,780	,,	,,	6⅜†	Do. B	115—118	5 8 0	..
65,500	,,	June 26	4	Do. 4 p.c. Deb. . .	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental .	150—160	5 12 6	..
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c. .	119—121	5 7 5	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. A	211—213	4 13 11	..
718,100	,,	,,	7	B	146—14	4 14 7	
306,083	,,	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	..

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d	
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd. . .	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	98½—99½	4 10 6	..
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	
300,000	Stk.	May 14	8	Oriental, Ltd. . . .	117—122	6 11 2	100—100
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .	7¼—7¾	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B . .	128—131	4 19 8	..
100,000	50	,,	12	Do. C . .	118—121	4 19 2	..
52,000	50	,,	10	Do. D . .	..	—	..
249,980	5	April 29	8	Primitiva Ord. . . .	5½—6	6 13 4	2½—2
499,960	5	June 26	5	,, 5 p.c. Pref. .	4¾—5	5 0 0	3 10/6
521,600	100	June 2	4	,, 4 p.c. Deb. .	91—93	4 6 0	..
—	—	—	—	,, ,, ,, 1911	..	—	..
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 8	..
209,984	,,	,,	10	Do. B	222—224	4 9 8	..
523,500	,,	,,	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African . . .	10½—11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	80—81
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	..
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	..
60,000	,,	,,	5	Do. 5 p.c. Pref. .	110—112	4 9 3	..
—	—	—	—	Do. West Kent. .	..	—	..
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord. . .	99—102	4 18 0	.
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c. .	135—138	5 8 8	..
742,275	,,	,,	6†	B 3½ p.c. .	115—117	5 2 7	..
181,255	,,	June 26	4	4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	,,	,,	6⅞	,, B 3½ p.c.	129—134	5 2 7	..
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110—115	5 2 0	..
352,000	,,	,,	6⅛	Wimbledon 5 p.c. .	117—122	5 0 5	..
98,000	,,	,,	6⅝	Epsom 5 p.c. . . .	121—126	5 5 2	..
88,416	,,	June 26	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

The office of H.M. Trade Commissioner for South Africa reports that tenders are invited by the Johannesburg Municipal Council, up to noon on the 9th prox., for the supply and erection, at the Council's generating-station, of a water-purifying plant with a capacity of 75,000 gallons per 24 hours.

The International Time Recording Company, Limited, are removing to larger and more convenient premises at No. 57, City Road, Finsbury, E.C., where they hope to be better able to look after the increasing demand for their Dey, Bundy, Rochester, and International automatic time-recording machines.

The Pastor of a Llandudno Congregational Church, while a guest in a house at Croydon, was, after complaining of feeling unwell, found dead on the floor of the lavatory, with the gas turned full on, and unlit. It was suggested that deceased, who was in a very weak condition, had turned on the gas and fainted, being then overcome. The Jury returned a verdict of "Accidental death."

It is reported from the United States that the works at Chester, Conn., where aniline dyes are being made by a secret process, are to be operated by the Middlesex Chemical Company, recently organized with $250,000 of preferred stock and $250,000 of common stock. The Company recently turned out the first pure carbolic acid crystals ever obtained in America, which is of "tremendous importance to the dye and acid trade."

The Rochester City Council have agreed to an arrangement with the Gas Company whereby the latter are to include in their quarterly bills a sum of £43 17s. 6d. in respect of the cleaning and repairing of the lanterns of the street-lamps which are not lighted.

A successful flower and vegetable show was recently held in the East Greenwich Gas-Works Institute; the opening ceremony being performed by Mr. A. F. Browne, the Acting Engineer at the station. There was an increased number of entries on the present occasion. The late Secretary (Mr. R. Stanton), now in France on active service, wrote wishing the show all possible success.

The Government of Newfoundland have forwarded to the Board of Trade for confirmation a contract made last April between them and the Newfoundland Products Corporation, Limited. It is proposed, *inter alia*, that certain articles shall be admitted, free of duty, either into the Colony or into Labrador: (1) All constructional material and machinery for the Company's mills, factories, and works, for the purpose of the manufacture of . . . fertilizers, carbide of calcium, and their bye-products, and for the purpose of such manufactures, both for original installation and further extension, but not in substitution for old. (2) All bags and packages for distributing the Company's products, as required by the Company for the purpose of the manufacture of fertilizers, &c. (3) All coal required by the Company for use in Labrador for the purposes mentioned.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Assistant Manager. No. 6092.
Working Manager. Isaac Carr and Sons, Widnes.
Chief Draughtsman. Liverpool Gas Company. Applications by Sept. 21.
Draughtsman. No. 6089.
Foreman. No. 6091.
Retort-House Foreman. Leeds Gas Department.
Works Fitter. Darlington Gas-Works.

Appointments Wanted.

Clerk. No. 6093.
Representative. Charrière, Paris.

Plant, &c. (Second-Hand) for Sale.

Keith-Blackman Compressor. No. 6094.
Gas Fittings, &c. R. J. Curtis, Union Offices, Birmingham.

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Gasholders. M. F., c/o Messrs. J. G. King and Son.

Meetings.

British Gaslight Company. 11, George Yard, Lombard Street, E.C. Sept. 29. Twelve o'clock.

Sales of Stocks and Shares.

Broadstairs Gas Company. London Mart. Sept. 21.

TENDERS FOR

Coal.

Sidmouth Gas Department. Tenders by Sept. 24.
Tralee Gas Department.

Fire-Clay Goods.

Llandudno Urban District Council. Tenders by Oct. 1.

Retorts (Resetting).

Todmorden Gas Department.

Tar.

Clonmel Corporation Gas Committee. Tenders by Sept. 30.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST. LONDON.

VOL. CXXXI., No. 2732.] TUESDAY, SEPTEMBER 21, 1915. [67TH YEAR.

EDITORIAL NOTES.

Toluene and the Value of a Catalyst.

THE technical officials of gas undertakings are helping the Government to the best of their ability and opportunities in providing toluene for the manufacture of high explosives. But, at the same time, the natural desire exists that the means of doing this should have the minimum adverse effect upon the heating quality of the gas, and in the promotion of naphthalene troubles. There is not much difficulty in these connections where high-class coals are carbonized, even at high temperatures; but where second-grade coals are used, the matter assumes a somewhat different complexion. From them, owing to their high oxygen and sulphur content, with high temperature carbonization, the coke and tar are both of inferior quality. Now when a process is introduced—only demanding a comparatively trifling initial and working cost—which claims to increase the quantity and quality of the gas, enlarge the volume of the hydrocarbons in the gas and tar, materially increase the toluene content, allow the recovery of an additional quantity of the toluene by tar washing without harming the calorific value of the gas, while leaving in the latter a sufficient quantity of hydrocarbons to prevent any naphthalene trouble, and coincidently improving the coke and the quantity of ammonia, lessening the sulphur content of the gas, reducing the graphitic carbon deposit on the inside of the retorts, and giving comparative freedom from pitched hydraulic mains and from stopped pipes—well, a process with such a combination of merits claims careful consideration and investigation to prove its capabilities.

Such a process is introduced in an article, contributed to our columns this week by a gas engineer who has been interesting himself in it. The system is the invention of Mr. A. Rollason, and is being introduced by the Synthetic Gas Processes Company, of Nottingham. The several advantages are all attributed to the use of a catalyst in the shape of finely ground limestone, which is brought into intimate association with broken coal before carbonizing at temperatures above 850° C. Thoughts naturally revert to the Cheltenham process in which lime is used for primarily reducing the sulphur compounds, and which, Mr. Paterson claims, has brought in its train various secondary advantages. But Mr. Rollason asserts that his proposals, using limestone, are quite distinctive in the principles forming the basis of his invention. The action of limestone, it is stated, is entirely different from that of lime. When intimately mixed with coal rich in hydrocarbons, and with a high oxygen content, the limestone commences to decompose at a lower temperature than that of the resinous and other matters in the coal. Tests on second-grade coking and semi-coking coal, showed that the limestone commenced to decompose at approximately 130° C. As to the quantity of lime to be added to the coal, this varies according to the constitution of the latter and the composition of the ash; but the amount should be sufficient to transform the silicates contained in the ash into neutral silicate. With available an analysis of the coal and knowledge as to the composition of the ash, it is only a matter of simple calculation to arrive at the correct proportion of lime required. The explanation of the actions that apparently take place during the process of carbonization is this: The calcium oxide when freed from its neutralizing agent—carbon dioxide—is in a nascent condition, possessing active chemical and catalytic properties, which assist in the decomposition of the volatile matters and organic bases contained in the coal, and facilitate the combination of oxygen and hydrogen forming water, and carbon and hydrogen forming hydrocarbons, thereby largely increasing the volume of hydrocarbons in the gas and tar. It is due to the reduction of the excess of oxygen by the formation of water at an early stage of carbonization and before the iron sulphide decomposes, that there is limitation of the formation of both oxygenated hydrocarbons and sulphur compounds.

Upon the process, Mr. Rollason has been for some years assiduously working—in fact, the first of a series of patent specifications referring to it dates back to 1911. Probably this was one of the processes to which Dr. Rudolph Lessing alluded in his William Young Memorial Lecture last year at the meeting of the North British Association of Gas Managers [see "JOURNAL," Sept. 8, 1914, p. 571]. Mr. Rollason lays stress upon a knowledge of the composition of the ash in determining the proportion of the limestone to be added to the coal before carbonization. Dr. Lessing said that, in his opinion, the chemical composition of the ash, or, to be more correct, the mineral matter in it, plays a certain part in determining the course of decomposition that a coal undergoes on carbonization. He had not the slightest doubt the lime in the Cheltenham process acted catalytically, accelerating the primary formation of permanent gas and of such tar vapours as are not liable to excessive decomposition down to solid carbon. With regard to the various processes that have been devised for adding to coal lime in the form of limestone or quicklime, we can only support, from observation and deduction from published information, without direct working experience, what Dr. Lessing suggested twelve months ago, that "there cannot "be any doubt that much advantage can be gained by a "more careful study of the mineral constituents of coals "and their artificial modification than has been attempted "hitherto." Data submitted to us as derived from working tests, and from knowledge of the careful inquiry by the gas engineer who has brought the process to our readers' notice, prompt us to recommend further investigation to other gas engineers. The combination of merits seems almost too good to be true; but there are the results from actual working, and there is the encouragement in this direction given by Dr. Lessing. Above all in these times, if a simple process exists that will supplement the country's demand for toluene, and yet give more gas, without depreciating calorific value, improve the secondary products, and relieve gas engineers from the bugbears accompanying high temperature carbonization—well, then, blessed indeed will be the calalytic value of limestone. We hope sincerely that the process will be thoroughly and independently investigated at several works; there is good reason for this being done.

Mr. Newbigging—Revolutionist.

ELECTRICIANS who have read Mr. J. G. Newbigging's paper before the British Association [*ante*, p. 588] have no doubt jumped for joy; for here they have the Engineer of the Manchester Corporation Gas Department, in effect, predicting the evacuation of the lighting field by the gas industry, and leaving it in complete possession of the electric industry. To be precise, so as not to give a larger meaning to his words than was intended, Mr. Newbigging's remark was: "In the case of a municipality controlling both gas and elec-"tricity supplies, there is no reason why the former depart-"ment should not eventually become the gaseous fuel sup-"plier, and the latter the light supplier." He anticipated that he might be described as a heretic by those in control of private gas enterprise. If he is so called by those and others, it will only serve him right; for it is not easy—in fact, it is impossible—to see what inclined him to give voice to such an unorthodox opinion. If abandonment of the lighting business is the correct thing for municipal gas undertakings, then it must be so for private gas undertakings. But in the paper and outside it, there cannot be traced the slightest reason for what Mr. Newbigging suggests. He seems to throw the idea at one, with the questions "What do you think of it? Is it not a brilliant notion?" To tell the honest truth, we do not think it is. There is every reason why gas undertakings should not relinquish the lighting business. If people want a light of good quality—a light of good illuminating power without high intrinsic brilliancy, and a light of good composition—gas can give it them; electricity cannot. If people want a light that has good diffusive power without external aid—gas can give it them; electricity cannot. If people desire a light that is more reliable than electricity, gas can give it to them. If people want a light that is more economical than electricity, gas can supply it. The gas industry must not deny the people these things, even if it could afford to do so.

There are economic considerations. From dusk, lighting is the staple part of the business of a gas undertaking. The maintenance of this part of the business is of the greatest economic importance to the undertaking. The days were when we were talking much about the levelling-up of the curve of output, in order to realize the utmost possible economy in production, and put the capital expended on much of the works, distribution, and other plant to the maximum possible use. The line of attack for this purpose was to develop the day load; and now Mr. Newbigging wants to put upon municipal gas-works a greater uneconomic yoke by handing them over to larger intermittency. As fuel and not light suppliers, the gas industry would have as a permanent day load (variable with locality and the vacillations of trade) the industrial heating business. There would be the intermittent use of gas-cookers and other kitchen appliances —chiefly in the day time, all the year round. Business would practically cease for the gas undertaking at 6 or 7 p.m. on summer days until next morning. Then, on the coming of winter, a great and variable load—" variable " according to atmospheric conditions—would be provided by domestic gas-fires, which would mean an immense provision of plant, with all the attendant expenses, practically for this purpose alone. A large diversity of business during all possible hours is a factor in the industry's economy; and lighting contributes to the economy. Thus, what Mr. Newbigging proposes would not promote more economical working and cheaper gas—that is to say, as the position is viewed from to-day's conditions. The gas industry will not, we are sure, be prepared to accept his idea without proof of intrinsic merit; nor will the electric supply industry. The electrical engineers are craving for more domestic electrification, so as (they say) to level-up their load, and produce more economic working. In addition to the economic question, Mr. Newbigging's amiable intention appears to be to completely hand over the consumers of gas for lighting purposes to electricity whether they would or no. They would surely have a right to be consulted as to their preference in the matter. We can see our Manchester friend finding himself occupying a position of splendid isolation in this particular matter.

Price is the main thing that stands in the way of a quicker and fuller adoption of gaseous fuel for heating purposes—domestic and industrial. But Mr. Newbigging's idea is not going to lessen the price for heating purposes by eliminating the fat lighting business of the gas industry, unless the proceeding conduces to the production of a lower grade and a cheaper gas. He believes (as we do) that the gas industry has a better opportunity than any other industry of solving the fuel question, and with it the smoke problem; and, after the war, vast possibilities will present themselves. To realize a low price, he thinks that gas of a calorific value of 250 to 300 B.Th.U. would make an admirable fuel, could be produced cheaply, and could be distributed at pressures higher than those now obtaining. The idea is a revolutionary one. There is no evidence as to what would be the effects—economic and in service. Without critical investigation, it is plain that it would mean a large upheaval of everything pertaining to the industry from manufacturing plant onward to the meters, and the appliances by means of which gas is used—involving, too, much scrapping and reorganization in the works of the manufacturers of gas-using appliances by the change in the character of the gas supplied. The millions of appliances, too, that are now in use for gas having a calorific value of 500 to 600 B.Th.U. would have to be adapted to the new low-grade and larger volume conditions; and the factories and businesses of those who supply gas-lighting fittings would have to be scrapped, or be turned over to the making and sale of electric lighting appliances.

The revolutionary picture is not exactly a happy one to contemplate. This is not the first time that there has been talk of supplying gas of a calorific value about half that now distributed; but never has the idea been accompanied by a proposal to abandon all the low-pressure lighting business now possessed by the industry. Several gas undertakings have special power-gas authorization; and a duplicate supply of low-grade gas in industrial areas seems to us to possess about it something of a more practical and feasible nature than the revolutionary ideals Mr. Newbigging puts forward.

A Difference in Heating Business Conditions.

That energetic body the National Commercial Gas Association of America are making a contribution to the proceedings of the American Gas Institute at the coming congress at San Francisco; and of some of the papers that they are presenting we give to-day abstracts in our news columns. The papers are varied, and very much to the point. Development of the commercial side of the gas business in America has been taken up quite as something apart from the manufacturing side; and it is proceeding upon purely scientific and technical lines—that is to say, the science of business is applied, and the commercial man must know his subject technically, and be something more than a reciter of prices, gas consumptions, and working capacities. To a large extent, the problems that face the American gas salesman are much the same as they are in this country; but in regard to the question of domestic heating, there is a substantial difference. There is not the same scope there for a gas fire as there is here. The field on this side, given low-priced gas, is practically without bounds; on the other side, there is a limited application through the large vogue of central heating. The gas-cooker has there been the means by which a great increase of gas sales has been effected; but as gas-fires have not the same opportunities as here—generally they are only used in America as auxiliary means of heating, and for employment just prior to, and immediately succeeding, the central heating furnaces being brought into use—the question arises as to how to develop the use of the gas-cooker throughout the winter months; for this seems to be accepted there as the direction in which to increase the domestic business in winter.

On this side, the convenience, and in many places the cheapness of gas, ensure domestic cookers being used well throughout the whole winter. But it appears, from the paper by Mr. R. E. Slade, of Providence, R.I., that this is not so in America. The two obstacles, he says, to the use of gas-cookers in the winter are that they do not heat the kitchen, and they do not supply hot water. We used to say the same thing in this country; nevertheless the cookers are largely used during the winter months, and the use grows. Nothing but convenience, the ever-readiness of the oven and the top plate, and the price of gas can account for this employment in the winter, notwithstanding that a small fire has on the coldest days to be maintained in the range for warming the kitchen. For this purpose coke is the fuel to be used. Now our American friends tackle this question in a different way under their different circumstances. What they do, it seems, is to heat the kitchen from the central heating plant; and Mr. Slade suggests that, by putting a coil in the furnace, hot water is secured at a minimum of expense for household use. This, however, can only be done during the winter; and it, of course, puts an additional tax on the central heating plant. One cannot draw and expend heat units from any system of heating without putting more fuel into it; and all these central heating systems are not large enough to stand the additional strain caused by kitchen heating and hot water supply in winter. Under such circumstances, what Mr. Slade suggests is that gas companies should encourage the installation of large central heating plants, so as to meet kitchen requirements and hot water provision in the winter. We are not intimately acquainted like Mr. Slade with American conditions; but we would venture to suggest that a good alternative to his proposal would be to have a second string to the bow. For large houses on this side, some gas undertakings are developing business in the coke-heated boiler, which is installed in the kitchen, so serving to heat it, and to give a constant supply of hot water through the circulating system. Even our opponents, the electricians, favour this system, rather than have gas-heated boilers put into houses in which they can bring influence to bear. Such a system would be equally useful in American houses practically at any time; and it might induce a shortening of the period of use of the central heating system, and bring other business advantages in its train to the gas industry. Certainly it would do precisely what Mr. Slade suggests, and that is promote the extended use of the gas-cooker in winter time by making the ordinary kitchen range wholly unnecessary. On this side, too, the gas-heated circulating boiler is providing quite a good and an enlarging branch of business. Why should it not do the same in America, and meet at any rate one of the conditions that Mr. Slade mentions as being up-against the more extended use of the gas-cooker? Is it that, generally speaking, the price of gas in America is too high?

If so, then perhaps the largest possibilities for the gas industry in America lie in the direction of doing what Mr. F. W. Frueauff suggests, in a paper on "Industrial Fuel"—that is, manufacture a gas of lower heat value, which can be produced and distributed at a less cost per heat unit than is now customary. Canada has set an example to the United States; and Canada has come very close to what is the practice in this country—not only in the interest of gas undertakings, but in those of gas consumers, who, with high-grade gas lose heat by the larger quantity of air that has to be introduced to the gas, and which therefore provides a larger quantity of inert constituents which act as a vehicle for carrying away heat from the bunsen flames. For any large development of gas heating in any line the chief essential is—gas appliances being procurable of quite high standard in design and efficiency—a cheap gas of the right composition.

One other point. In Mr. Frueauff's opinion, gas undertakings have not fully realized the importance of technically trained men for developing the industrial side of their business. We are afraid that is also largely the case on this side. Salesmen who have been accustomed to gas lights, cookers, and fires, other than in a few cases, really know but little of the hot-water and the industrial branches of the business; and no slight harm has been done through this. New developments of these kinds almost require special men under the commercial chief—men who can devote time to attaining technical proficiency in the work, so as to take up the exploitation of the business on correct lines. Where an undertaking cannot afford such special men, then steps should be taken to obtain a proper technical training in the new branch for the man already in charge of the sales department. These are really important questions for the managers of gas undertakings—as important, let us say, as the question of whether vertical retorts or horizontal retorts, machine operated from one side of the bench only, should be adopted, or whether telpher or some other form of coal and coke transport should be installed. The policy applied to the outdoor department to-day, without any doubt, settles the measure of stability which will be enjoyed by a gas undertaking in the future.

Dublin again—Where Credit is Due.

THERE is no question that the affairs of the Alliance and Dublin Consumers' Gas Company look healthier to-day, despite the war, than they have done for some time past. But there seems to be some misconception in Dublin as to whom this is pre-eminently due. Bad administration can run an undertaking into deep mire in a short time; and it may be difficult to extricate it. But the extrication in such a case can only be done by specialists, and not by amateurs at the particular work. The latter left alone might make difficulty and loss the more pronounced. In "Anticipant's" letter which appeared in the "JOURNAL" a fortnight ago, the writer appeared to think that much of the late grave condition of the concern was due to the old administration, and that the credit for the more healthy state was due to the new units on the Board. We also see from the notice convening the meeting of proprietors for the 30th inst, that a proposal will be submitted to divide among the Directors resident in England—the new Directors—£1000 for their "special" services, and provide annually additional remuneration of £500 for division among them.

It is a question whether the English Directors are the proper recipients of any extra reward—present and annual. Before this question can be settled, the appeal by "Anticipant" a fortnight ago, and by Mr. R. W. Edwards a week since, should be granted, that publication should be made of the experts' report which divulged the weaknesses in, and indicated the way to increased strength for, the concern—"increased strength" resulting in better public service and profit. The publication of the report, which has been kept secret so long, could to-day do no possible harm, except that it might show up a little more clearly the directions in which the drift and the incapacity obtained which had landed the concern into its difficulties. It might be found then that the uneconomic conditions were not only administrative but technical, and that they were such that no one but experts could have relieved the concern from its accumulation of wasteful burdens and troubles. If this be so, then the directions whence the salvation of the Company has come are to be traced principally to the work of the investigating and reporting experts—Mr. William Newbigging and Mr. W. R. Herring on the one hand, and Mr. William Cash, F.C.A., on the other; and to the work that Mr. Newbigging has since done in producing order from chaos. That so much has been accomplished while the external conditions are so adverse, is an additional feather in Mr. Newbigging's professional cap. While we do not belittle their work as members of the Board, we cannot admit the possibility of three gentlemen passing over from Lancashire to Dublin (expert probably in one industry, but not in such a highly specialized one as the gas industry) bringing to a head those technical changes in works, methods, and administration that have been necessitated at Dublin. If this could be done under such conditions as those which existed at Dublin, then we should be disposed to say that all the work that is done in the training of men for professional service in the gas industry is labour in vain. If special reward there is to be, then it should assuredly be to those professional men who revealed the leakages in technical and administrative parts of the concern, and pointed the way to reform. The provision of an additional £500 per annum for the Directors living in England, and bringing no technical gas qualification to bear on their work, represents on a 5 per cent. basis a capitalized sum of £10,000.

Before the stockholders vote away the proposed sums, they should make it a condition precedent that the report of the experts should be disclosed to them, so as to enable them to judge to whom honour is pre-eminently due. If the report assures them the three gentlemen from Lancashire detected all that was wrong, and suggested the modes of rectification, then the £1000 and the additional £500 a year could be voted to them by the proprietors with hearts in a state of supreme thankfulness. [Since this article was written, a letter has been received from a stockholder in the Company, and it appears in our "Correspondence" columns, suggesting that reform of the concern might with advantage be extended to the Board of Directors.]

Coal Exports.

In the last reference made in the "JOURNAL" to coal exports, it was shown that, at the end of the first year of the war, the reduction in the quantity exported, compared with the twelve months ending July, 1914, was 29,566,410 tons. When the war started, of course the export trade was immediately affected; and the exports of coal which in August, 1913, amounted to 5,819,162 tons fell in August, 1914, to 3,070,742 tons, or a reduction of 2,748,420 tons. In August this year, the amount exported was 3,650,472 tons, or an increase on August last year of 579,730 tons, and a reduction on August, 1913, of 2,168,690 tons. Regarding the increase last month of 579,730 tons, it may be mentioned that France took nearly a million tons more than in August last year. Coke exports are rising. Whereas in August, 1913, they amounted to 113,423 tons, in August, 1914, they were down to 68,498 tons; but in August this year they were up to 89,574 tons—an improvement on August last year of 21,076 tons, though still short of the quantity exported in August, 1913, by 23,849 tons.

A Further Report from Australia.

Following close upon the report of the meeting of the Melbourne Metropolitan Gas Company comes that of the Australian Gas Light Company, who carry on their business in Sydney. The war has evidently affected the operations of the Company, but only to the extent that the increase in the consumption of gas has not been so great as formerly. When the first half of this year is compared with the corresponding period of 1914, there is seen to have still been a substantial gain in output; while taking the year to June 30, and comparing it with the preceding twelve months, an addition to the sales to the extent of 7 per cent. is found. If so satisfactory a result can accompany the practice of economy in the domestic affairs of consumers, and a falling-off in building operations generally, the proprietors have every encouragement to anticipate with the keenest pleasure a return of normal times. Strong aids to lasting prosperity are being secured through the continued sale of large quantities of gas cooking and heating apparatus—a policy which figures quoted at the meeting prove to have been actively followed. Already the Company have disposed of cookers to about 33 per cent. of consumers; and that the proportion so provided is growing is evident from the fact that, while the number of consumers last year increased by 6013, the number of gas-cookers sold during the same period was 3298, or well over 50 per cent. In addition to the tendency towards economy on the part of the consumers, the war, by rendering it impossible to secure freight from England for materials, has interfered with extension work now in hand; while a miners' strike led to the securing of inferior qualities of coal at greatly enhanced prices and increased freight. It is a pleasure to be able to compliment the Australian Gas Light Company also on the patriotism of their employees, close upon a hundred of whom have taken advantage of an offer by the Directors to keep open the positions and make up the salaries or wages of those who were desirous of serving the Empire.

Sulphate of Ammonia in Germany.

Not much reliable information leaks out as to the position of the internal affairs of Germany; but scraps do occasionally come to hand—some seemingly reliable, while others one does not know whether or not to believe, for the intelligence of one day is often contradicted by that of the next. We may, however, take it that the report of the Deutsche Ammoniak-Verkaufs-Vereinigung is a document that is worthy of credence. There are extracts from it included in the American review of the market for sulphate of ammonia during 1914, as published in our news columns to-day. German middlemen dealing in sulphate of ammonia—the fertilizer required for the maximum production of the national food—appear to have been, during the first months of the war, as greedy for profits as some of our British coalowners and dealers were, with the same result—the Governmental curb was applied. On the outbreak of war, it was soon seen by the German sulphate dealers that, with the restriction of the imports of Chilian and Norwegian nitrates, there would soon be a dearth of tangible nitrogen in Germany. Then the balance between the supply of sulphate of ammonia and the demand began to show a heavier inclination on the side of the demand. The opportunity had come; and the middlemen commenced to reap an unusual golden harvest. The Government intervened; and maximum prices were established. The export of nitrogen was also prohibited. The German Federal Council, as has already been announced in the "JOURNAL," have introduced a Bill for the creation of a nitrogen monopoly in Germany, extending to 1920. But this, it is believed, is being strongly opposed.

Restricting Output.

Reference was made in last week's issue to the speech of Mr. Lloyd George before the Trade Union Congress at Bristol, in which he impressed on his hearers the necessity of the unions suspending during the period of the war all regulations and practices which have the effect of restricting the output of material In the course of his remarks, the speaker made the grave allegation—in the circumstances, one of the gravest allegations he could have made—that in many cases munition workers and others are not doing, and are not allowed to do, their best. He quoted instances in support of this assertion; and in connection with one which he had referred to as having taken place at Coventry, correspondence has since passed—to the discomfiture of the local Labour Advisory Committee. The fuller particulars now brought to light show that a letter signed "Secretary of Committee," was passed round the works; and in this it was stated a man, who was named, had done in 8½ hours a 31½-hour job. The writer added that this was not the first time there had been complaints of this man exceeding double time; and he wished "all men would spare a minute, and come and have a look at him." The man thus complained about was engaged on a howitzer, upon the prompt delivery of which, perhaps, valuable lives depended; and trade unionists, or anyone else, would find it hard to justify the condemnation of any action which would have the effect of hastening the completion of the weapon. And this instance, be it noted, Mr. Lloyd George quoted as being only one among many examples throughout the country of difficulties encountered over the removal of all restrictions on output.

Profit-Sharing.

In spite of the pessimists, profit-sharing and co-partnership are evidently quite successfully withstanding any test which less prosperous times are in certain quarters believed to impose upon them; and so they are still regarded as the most promising means of promoting goodwill between employers and employed. Up to the outbreak of the war, the adoption of co-partnership principles was making steady progress in the gas industry, and there were converts in other directions. But during the last twelve months it is to be feared most people have had their attention too much occupied by other matters to give thought to domestic developments of this character. We shall not, however, always be at war; and, as Mr. E. G. F. Higginson points out in a letter to the "Daily Mail," there is the future to be considered. Whether or not he is right in his idea that the war has widened, rather than narrowed, the breach between Capital and Labour, there is no need to determine here; for, in any case, there is no doubt such breach as does exist will, as he says, unless carefully handled, prejudicially "affect the improved social conditions to which we all look forward when the victory of the Allies shall have brought the great war to an end." It is for the purpose of healing this breach that he challenges responsible representatives of both Capital and Labour to state their objections to the introduction of a system of profit-sharing into every trade, business, or industry in which it can possibly be instituted. The very considerable experience so far recorded by gas undertakings in connection with the matter will not be claimed on the side of the "objectors."

Non-Explosive Acetylene Gas.—An acetylene gas generating apparatus in which the gas is claimed to be made non-explosive by mixing it with oil gas—the two gases being produced simultaneously—has, says the "Engineer," been patented in the United States. The gas is intended for welding and cutting metal, but may be used also for mine and other lamps, domestic purposes, &c. The cost of production is said to be very low. The generating charge is put up in a sealed cartridge. Water is fed to the carbide, and is under control. The cartridge has a central tube, around which are packed layers of carbide separated by layers of sawdust saturated with crude oil. Sand or other inert material may be used, instead of sawdust. When water is admitted to the central tube, it starts the conversion of the bottom layer of carbide, the heat from which vaporizes the oil in the first layer of sawdust, and so on with the others in turn. The oil vapour serves to absorb any excess oxygen.

Coal Prices and State Control in France.—The French Chamber of Deputies have referred to the Mines Commission for consideration a Bill which has been introduced for the purpose of preventing speculation in the sale of coal. It is proposed that during the course of the war, and in the six succeeding months, the price of coal shall be fixed. In the case of each mine, the sale price of the coal, according to quality, shall be settled by the Government on the basis of the average prices realized in the past five years, and taking into consideration present conditions of working. These prices are to be exclusive of any so-called delivery premium. The Prefect in each Department, on the advice of the local Chamber of Commerce, will be authorized to fix the sale prices to consumers by taking into account the origin of the coal, quality, cost of transport, and a normal commercial profit. The wages of the miners and other wages are not to be less than those prevailing on Aug. 1.

Chemistry and Manipulation of Gases.—In the course of some notes on the portion of Professor W. A. Bone's British Association address which dealt with the economical use of coal [*ante*, p. 581], the Engineering Correspondent of the "Yorkshire Post" says: "Much of the neglect which the question of fuel economy and the proper utilization of coal has suffered, Professor Bone laid at the door of the chemists, who are, he stated, not only lamentably ignorant for the most part of the nature of coal and of modern fuel technology, but have been for many years past so indifferent about such questions that they have been content to leave them almost entirely to engineers, who, as a body, are notoriously deficient in chemical sense and experience. The engineer has not usurped the place of the chemist, but has had to do his best to fill the position long since abdicated by the chemist. Such advances as have been made in recent years have nearly all been in the direction of the wider application of gaseous fuels, yet in how many of our University laboratories is even gas analysis taught? How many of our schools of chemistry provide systematic courses in the chemistry and manipulation of gases, without which no prefessional training of industrial chemists, however much 'research work' it might include, ought to be considered satisfactory? The answer to the questions would hardly reflect credit on the higher technical education system in Britain, though the record of Leeds University stands out as an honourable and distinguished exception."

JOSEPH HEPWORTH.

Death last week removed another of those men who for many years have borne an honoured name in the gas industry, in the person of Mr. Joseph Hepworth, M.Inst.C.E., who passed away last Tuesday, in his 74th year, at his residence, No. 7, Priestfield Road, Edinburgh.

During the past twenty years, Mr. Hepworth's business engagements were of a character which did not bring him prominently before the members of his profession; but previous to that time, for many years, there were few activities of what one may term a public character in connection with the industry among the leading spirits of which the name of Hepworth was not included. His work as Honorary Secretary of the old Gas Institute made him many friends, as did also the performance of his general duties and the extensive private labours which he undertook in Carlisle, where for a period of about a quarter-of-a-century he occupied, with distinction, the dual position of Gas and Water Engineer.

Born at Delph, in Yorkshire, Mr. Hepworth received his engineering training at the Coventry Gas-Works, under the late Mr. W. L. Robinson; thereafter spending three years, beginning in 1867, as Engineer of the Brighouse Gas-Works. In 1870, he entered upon his duties at Carlisle, and immediately found himself confronted—as no doubt he had anticipated when contemplating taking up the position—with ample scope for his engineering abilities. He at once took in hand the task of improving the works, and at the end of five years had the satisfaction of noting that there had been an increase of nearly 34 per cent. in the output of gas. In fact, during his tenure of office, the productive capacity of the works was increased threefold, to his designs and under his entire supervision; the distributing system also being overhauled and improved to such an extent that the unaccounted-for gas was reduced almost to 1½ per cent. Much the same may be said of the water-works, which, under Mr. Hepworth's fostering care, were enlarged, and the profits increased, with a lower charge to the consumers.

When, at the end of his 25 years' work, he left Carlisle, he received many tokens of appreciation and esteem at the hands of the staff and workmen, the citizens, and the Corporation, who decided to ask him to act as Consulting Engineer for a period of two years. This offer Mr. Hepworth did not see his way to accept; but he expressed his willingness to render any assistance in his power should the Corporation at any time require his services in connection with the works. A presentation, subscribed for by the townsfolk of Carlisle, consisted of a silver tea and coffee service, on a handsome silver tray suitably inscribed, a case of silver spoons, forks, &c., and an illuminated extract from the minutes of the Corporation expressive of their appreciation of the services of the recipient. The speeches made on the occasion of this presentation were expressive of the high opinion of his abilities that was held by those with whom he had been closely associated for so great a number of years, and of a recognition of the fact that by his departure they were losing not only a valued official but also a sincere friend.

It was in April, 1895, that Mr. Hepworth severed his long connection with Carlisle; and he did so for the purpose of becoming a Managing-Director [with Mr. W. Henry Cowan and Mr. J. L. Cloudsley] of Messrs. W. & B. Cowan, which firm had just been converted into a limited liability Company. For this purpose, he went to live in Edinburgh, where he resided until his death. The conditions of his new appointment were fortunately stated to allow of his continuing his considerable practice as a consulting gas and water engineer. He designed and carried out various new works and extensions in connection with gas and water undertakings in the North of England and in Scotland; and he was also frequently engaged as a consultant and witness in the Parliamentary Committee-rooms, as well as in connection with gas-works purchase arbitrations, and similar proceedings throughout the country.

In 1891, Mr. Hepworth was President of the Gas Institute; and those members who were present will remember how successful from all points of view was the meeting held in Carlisle that year. It has already been mentioned that for some time he acted as Hon. Secretary to the Institute; and it may be added that upon his retirement from this office, he was, at the meeting in 1896, presented with a handsome silver rose-bowl; the President (Mr. W. R. Chester) remarking that he hoped it would convey in some slight degree the feelings of the members towards Mr. Hepworth, and "their appreciation of the services he rendered so admirably during a critical period in the history of the Institute." Up to the time of his death he was an honorary member of the Institution of Gas Engineers. Mr. Hepworth's election as an associate member of the Institution of Civil Engineers took place in 1877; and he became a full member in 1889. On going to live in Scotland, he joined the North British Association of Gas Managers and the Waverley Association of Gas Managers; and he was also a member of the North of England Gas Managers' Association. The contributions he made to the proceedings of these societies, and his genial manner and desire to assist others whenever possible, will cause him to be sadly missed at the meetings of all these bodies.

The interment was at Grange Cemetery, Edinburgh, last Friday, amid many manifestations of sorrow.

PERSONAL.

The "London Gazette" last Thursday notified the promotion to the rank of Captain of Lieutenant W. E. Brock, of the Army Service Corps. Captain Brock joined the army shortly after the commencement of the war, and was, prior to that time, Manager of the Denbigh Gas and Water Company.

Dr. J. S. Haldane, F.R.S., was at last week's annual meeting of the Institution of Mining Engineers at Leeds presented with the Institution gold medal, in recognition of his investigations regarding mine air. In making the presentation, Sir T. H. Holland remarked that Dr. Haldane's work had been of direct humanitarian value to mining communities in every part of the world.

OBITUARY.

"Het Gas" reports the death in Belgium of M. Alfred Boscheron, who had been a Member of Council (and President) of the Belgian Association of Gas Engineers. When acting as Engineer to the Liège and Angleur Gas-Works, he introduced there the "Radol" system of retort-settings, which have vertical regenerative flues, and dispense with the ordinary grate-bars. This system has since been adopted both at Bergen-op-Zoom and Winschoten, in Holland.

The Leatherhead Gas and Lighting Company have lost a promising member of their clerical staff by the death by a shell at the front of Private Selling Daniel Smith, of the 23rd London Regiment. Mr. Smith (who was the younger son of the Epsom Manager of the Wandsworth, Wimbledon, and Epsom Gas Company) enlisted about twelve months ago, previous to which time he had been for about seven years a clerk in the offices of the Leatherhead Gas Company, by whom his death is felt to be a great loss.

The body of Mr. Thomas Bower, whose death was recorded in last week's "Journal," having been brought from Wales, was interred last Wednesday in West Hartlepool Cemetery, after a largely attended service in Wesley Church, the congregation at which included many representatives from the Gas and Water Company, various public bodies, a number of gas managers, Freemasons, and others. Among others present were Mr. O. K. Trechmann (Chairman), Mr. William Scott (Secretary), and Mr. A. W. Branson (General Manager), of the Hartlepool Gas and Water Company. At the close of the service, the body was borne down the aisle by members of the staff of the Company. The large number of floral tributes included one from the North of England Gas Managers' Association.

ELECTRICITY SUPPLY MEMORANDA.

The Sin of Impartiality.

The "Electrical Times" does not appear to be altogether pleased with the report of the Departmental Committee on the Lighting of Factories and Workshops; and "Meteor" has expressed his opinion of it in extremely fiery language. It is apparently not what he expected, in view of the electrical element in the composition of the Committee, with not a single member possessing direct association with gas lighting. The impartiality of the Committee is magnified and magnified until it amounts through the meteoric pen to a sin of the blackest character. But we rather incline to think the men composing the Committee will ignore the very stupid and violent outburst. "Meteor" constitutes himself a competent judge. He could have done much better than the Committee without going through any such nonsense as an inquiry, and spending money on investigations, reporting, and the printing of reports. Which is the best light for factory and workroom lighting? And the straight answer would have come from the biassed "Meteor"—"Why electricity of course;" and reasons for the reply would not have troubled him. In fact, he does not deign to give any reasons for his hysterical outburst upon the Committee, save that he leaves his readers to infer that he does not like the report, because it does not say the electric light is the light *par excellence* for all purposes, which is a very silly attitude, and the Committee know it to be so. If this is not the meaning of what "Meteor" has written, then we have not properly interpreted it; but we undertake to say that no one else could put any other interpretation upon the amusing tirade.

The Folly of Blind Partiality.

We are pretty safe in our interpretation. "For sources of light," the Committee wrote, "incandescent gas and electric light are now far the most widely used." "Meteor's" comment is: "Ten years ago, incandescent gas was, in proportion, far more widely used than electric light. Are vanishing conditions of much use to us? Is it not mischievous to instance a predominance which is rapidly disappearing, and to hold it up for future public guidance." Rather more than twenty years ago, the gas industry had only *half* the annual business in gas that it did in the year preceding the war; and at the earlier period it had comparatively little daylight consumption. In the two decades, it doubled its annual gas business; and from 40 to 50 per cent. of the business of many concerns is represented by day consumption—leaving upwards of 50 per cent. (or more than the business of the days when electricity supply through general distribution systems entered the field) for the hours of darkness, notwithstanding the fact that the wasteful flat-flame burner had large prevalence twenty years ago. What does it mean? More business during the hours of darkness, and yet economical incandescent burners are prevalent now—a cubic foot of gas giving 20 to 25 candle-hours where it only gave 2 candle-hours before. "Vanishing conditions," a predominance "rapidly disappearing!" What an amount of folly there is in a partiality that is blind to concrete facts! The knowledge of our friend placed against the actual facts makes his censure of the Committee and their report all the more ludicrous.

The "Best Illuminant" for Workers.

"What concerns the workpeople's welfare is which illuminant is the best?" We are not certain that the definite determination of this point was part of the reference to the Committee. They were to inquire and report as to "the conditions necessary for the adequate and suitable lighting (natural and artificial) of factories and workshops, having regard to the nature of the work carried on, the protection of the eyesight of the persons employed, and the various forms of illumination." Because the Committee did not say electricity is the best, they have been spending money on "the perpetration of a mediocre joke;" and "really is it not squandering the public funds to conduct such careful investigations as these, and then to publish a silly travesty of the results?" So speaks the petulant "Meteor" of the report to which the names of Dr. R. T. Glazebrook, C.B., F.R.S., Mr. Leon Gaster, Dr. J. Herbert Parsons, Professor C. S. Sherrington, D.Sc., F.R.S., Mr. W. C. D. Whetham, F.R.S., and Sir Arthur Whitelegge, K.C.B., are attached. These men, says the critic (who is not over-prudent in the choice of his terms), "are absolutely determined that gas shall be regarded as of equal value with electricity, and what possible profit can be derived from an assumption which amounts to scientific falsehood." Now what are the facts? The National Physical Laboratory experiments with seamstresses and tailors show that workers prefer a direct light, not an indirect one; and the indirect system is shown to be most uneconomical by the time the degree of illumination with it is reached which the workers want, and which can be obtained for a lower expenditure by direct lighting. But the ophthalmic surgeons say that the complaints of eye trouble they receive are largely attributed to working by electric light; and they in consequence recommend indirect lighting, or the use of other forms of screen. The recommendation of the ophthalmic surgeons is therefore opposed to the practical requirement of the workers. This being so, it is preferable that of the two commonly used illuminating agents, the high intrinsic brilliancy one should not be recommended. That the intrinsic brilliancy of incandescent mantles is much lower than that of metallic filament lamps is a scientific fact and not a scientific falsehood. Under these circumstances, which is the better illuminant for the workers' use? Surely not the one of high intrinsic brilliancy. There we have the answer to "Meteor's" declaration: "What concerns the workpeople's welfare is which illuminant is the best?" The deduction is readily made from the report and appendices as to the superiority for the eyes of workpeople of the light of relatively low intrinsic brilliancy, and the light that can be adjusted to the needs of each worker by the worker himself. Among other foolishness in the strictures of "Meteor" is this: "Violent fluctuations in gas-mains are shown to have caused complaint." Perhaps the writer of this statement will give us chapter and verse for it, as well as describe what he really means by condescend to "violent fluctuations."

Voltage Surges.

In the confusion caused by the overloading of their minds with ideas derogatory to gas, and the rejection of all that is said favourable to gas as being simply too absurd for their acceptance, electrical engineers give vent to most inflated statements concerning the popular rival. Small local variations of gas pressure, for example, have most remarkable effects in the abstract, but in practice these effects are not noticed. A singular thing, however, is that a condition that is assumed to be so fruitful of trouble and bad result in the case of gas is not so in the case of electricity. Modern electric apparatus, some not over-conscientious electrical men assert, is oblivious of the small variations of voltage that occur in the electricity systems, and some electrical purists go so far as to say there are never any variations of voltage worth the description. The honest ones do not agree, though naturally they do not go out of their way to tell the public the truth of the matter. There has been a good deal said lately about electric surges, and to the need for protecting plant against them. Electrical systems, says one writer on the subject, are never at rest. Surges of some dimensions or other are continually passing to and fro along the mains; and while in the past breakdowns of generators and transformers have been attributed to defects in the insulation of the machines, many have really been due to the stresses imposed upon the insulation by the accumulated magnitude of the surges arising from some unknown causes. The General Electric Company have been studying this question, and announce their ability to undertake the complete protection of electrical systems against any voltage surges. To four principal causes are due the voltage surges occurring in alternating currrent systems: (*a*) Resonance, (*b*) switching, (*c*) arcs and sparks, and (*d*) lightning effects. We will not describe the condenser which is the apparatus used for preventing damage, because our readers would not be very interested in it, even when they learn that it is the "only surge protective device which modifies the wave form of deep-fronted waves." What interests our readers more is that voltage surges require the use of such apparatus to effect reductions. There is nothing new in this; it is only that these pressure surges have become more pronounced with the increased variable demand upon electricity systems. But the one device will not protect against all conditions; and a supplementary device is required. For example, while a condenser will, it is said, protect against excess pressure of high frequency, and against steep wave front, with it must be installed a complementary device to protect against surges of low frequency and high voltage.

Chimneyless Rooms.

The "Electrical Review" has just been publishing a series of articles on "The Selling Side of Electricity." In No. 4 there is advocacy of the chimneyless room, against which hygienists and doctors protest, especially when the rooms are used for nocturnal repose. The chimneyless room suggests something of box-like dimensions and appearance; and the incarceration of one's self in such an "apartment" would, we imagine, be sufficient to give one nightmare. The "Review" says that "a feature of several new blocks of flats recently erected in London has been the elimination of fire places in certain of the rooms, principally bedrooms." The considerations that have led to this change have been economy of space and the clean sweep and larger effect of the unbroken walls, which add considerably to the attractiveness of the rooms, and leave the occupants more choice in the placing of furniture. Weak, dear "Review"—very weak! The need of the economy of space by the elimination of the fireplace suggests a sort of rabbit-hutch; and unbroken walls a monotony. Given these unbroken walls and the monotony of light reflected from the ceiling, and the occupant of such a room might speedily be a candidate for a lunatic asylum. A central feature on one side of the room such as is provided by fireplace and mantel adds, in our opinion, to the attractiveness of a room, and is not a detraction. Then the argument goes on that there is a saving of material for fireplaces, mantelpieces, tiling, and chimney pots. So there would be if there were no furniture, and the occupants lived with space, as well as walls, unbroken, so contributing to what the "Review" case-maker for electric heating calls "attractiveness." Is it a fact that there are any bedrooms constructed in London without chimneys or flues in them of some kind? We have always understood that the London Building Acts require some such provision.

Electrical Absurdities.

The "Review" writer goes on to say the ventilating value of a chimney is trifling when a fire is not "on;" and the open window is far more healthy. How remarkable! We submit that the open chimney is valuable even when a fire is not "on;" and especially when, summer being over, the occupants of rooms have a singularly common practice of closing windows tightly. The hygienic value of a chimney is not to be destroyed by vapid sentences such as find accommodation in the "Review" article. Then we go on to read that, when there is a coal fire, there is a risk of the chimney smoking; "a down-draught being particularly dangerous in such a common complaint as bronchitis, or, in fact, any ailment connected with the respiratory organs. This risk is, by the way, equally present with a gas-fire, perhaps in larger degree, owing to the fumes being invisible." That really is about the most silly statement in the article. All chimneys are not defective; and, suffering from bronchitis or any other ailment associated with the respiratory organs, we would rather be sleeping in a room with a chimney than with our own organic emanations, and no outlet for contributing to the change of the air of the room. We have a big healthy population, judging from the health statistics, and by comparison; we have now the biggest Army and the biggest Navy that we have ever had; and all the components of population and active Army and Navy have been brought up in rooms with chimneys in them. May we be preserved from these electrical fanatics, whose one and only object in advocating the abolition of chimneys in new residences is to try to secure the larger installation of electric-heaters, without a care for the contribution they are making to the enervating conditions of life. Gas-fires are being largely used and recommended by the medical faculty, because of the large percentage of radiant heat given off; because of the up-draught created in chimneys, thus promoting ventilation; and because, with the modern construction of fires, there is efficient guard against escape of the products of combustion. If the writers on this subject in electrical papers had an analysis of the products of combustion of a coal fire, and then of a gas-fire, they would wonder how it is that, with down-draught chimneys and the poisonous emanations of a coal fire, they are alive, and providing the evidence of a personal limitation of intelligence, from which men possessing scientific knowledge of these matters—men who have been brought up, and have lived all their lives, in rooms possessing fireplaces and chimneys—gather amusement, or by which their pity is excited.

The Originator of the Retrospective Clause. Colonel A. Sinclair, of Swansea, must be a proud man to-day, but it is a pity the Corporation have not the power to award him a "D.S.O." or some other substantial mark of distinction for his services. However, they have done the next best thing; they have cordially thanked him. It seems, according to the "Electrical Review," that the Colonel was instrumental in inducing the Executive Committee of the Municipal Electrical Association to take up the question of the exclusion of existing contracts from the Coal Prices Limitation Bill; the result being that, now they are included, contracts entered into prior to the passing of the Act would, with certain conditions fulfilled, benefit—not as the "Review" puts it, "to the extent of 4s. per ton, but to the extent that the contract prices at the pit-head exceed 4s. per ton on 1913-14 contract prices. We rather imagined that other men and other bodies had a great deal to do with bringing the retrospective clause into existence. But now we know, on the authority of Colonel Sinclair's Swansea friends, and the publication in the "Review."

Life of "Half Watt" Street Lamps. Careful records are being kept by the Hamilton (Canada) Hydro-Electric Department of the life of different types of street lamps. During 1914, the city installed some 1000 500 watt nitrogen-filled lamps; and a report, dated May 22 this year, states that 977 lamps had given a total of 1,456,848 hours of light. This is an average of 1491 hours per lamp, including all defects. Some of the original lamps were at the date mentioned still in operation. It would be interesting to have particulars of costs per lamp, with initial outlay.

HOW TO COOK BY ELECTRICITY.*

Cookery teachers and demonstrators who become identified with the art of cooking food by the aid of electricity appear to think it necessary that they should figure as authors of cookery books. Consequently, the electrical cookery books that have of recent years courted the attention of those interested in the subject are beginning to show bulk. Both the ladies whose names appear on the title page of the book now before us—Miss Amy Cross and Miss Alys Waterman—we have heard of before; and Miss Cross's efforts with brain and pen in the cause of electric cooking have been under our criticism on previous occasions. The present book is entitled "How to Cook by Electricity." At the top of the introductory pages, it says: "Please read carefully before using the recipes." The book has been read carefully by the reviewer, not before using the recipes (because he does not know much about them), but before writing the review. As a result, it may be at once said that there is not much in the book of which complaint can be made from the gas industry's point of view. There have been cookery books of electrical origin which have spoken very ill indeed of the popular competitor. "Poisonous gas fumes" have been mentioned, and much else said that has been not only childish but slanderous, and which disclosed a complete want of acquaintance with elementary considerations affecting the subject. We congratulate Miss Cross and Miss Waterman on having the good sense to abstain from making (excuse the word, there is no other fitting term) fools of themselves in the eyes of those whose scientific knowledge enables them to find amusement in the method of treatment by some electrical cooks of matters upon which they have attested perfect ignorance. Naturally, the joint authors make out the best possible case they can for electric cooking; but they show a large amount of discretion in screening by omission the other side of the case. Electric cooking, they say, "is easy." If the numerous instructions in the book mean anything at all, it is not so easy as the gas method. "It is clean;" and so is the gas way. "It is safe." Nothing is said of shocks and breakdowns. "It is hygienic;" and so all tests applied to the gas method show it to be. "It is up-to-date." Not in economy of money and time. From first cost onwards, expert testimony as well as experienced users show that the hands of the latter have always to go deeply into their pockets. "It is scientific." The book shows the necessity for the application of laboratory methods, and of a perpetual struggle against loss of heat. "It ensures perfect results both in the appearance and in the flavour of the food cooked." That is merely a matter of opinion. We have seen the smile of the investigators of the products of electric-ovens. "Meat cooked in an electric-oven loses much less weight than when cooked in any other way; and this means a large decrease in the butcher's bill." The loss is altogether a question of the cooking temperature and the constitution of the meat.

It seems that what the authors regard as "scientific" cooking is cooking by the use of a thermometer in the oven. With a thermometer it is said "more certain results" can be obtained. Yet later on, we get the authors acknowledging that definite temperatures cannot be given by them because there is as yet no standard electric-oven; and therefore they do not claim that the temperatures named in the book are the best for every type of oven. Let us also suggest to the authors that there are no standard joints of meat—that weight and constitution of meat differ greatly. Then, again, the temperatures given by a thermometer used as the authors advise are not the actual temperatures inside the oven. They themselves admit that a thermometer suspended inside the oven would return higher readings. The heat-measuring system they advocate, so as not to waste the precious heat by opening and closing the oven door, is to have a thermometer fixed in the centre of the door of the oven, but registering outside, and projecting inside about 2 inches. What on earth is the use of a thermometer fixed in this way? It must misguide, instead of guide, the user. In a note on p. 17 of the book, it is stated that "different types of ovens vary a good deal in the time they take to heat." This is so with ovens of the same cubical capacity; and it is due not only to construction, but to external draughts and temperatures, which vary with the seasons of the year. The starting and subsequent external temperature of the casing itself, as well as the question of whether an oven is packed or unpacked, and the losses great or small by radiation, must always more or less affect the amount of current required for heating-up to, and maintaining, a given temperature. If these conditions affecting temperatures are pieced together, do they not suggest to the authors that there may be a considerable difference made by external cooling influences and the temperature of the casing (especially in the winter) upon the registration of a thermometer fixed as they suggest through the casing? Upon the whole, therefore, we are not persuaded, by the application of the law of cause and effect to this matter of the thermometric control of the domestic electric-oven, that the authors have made out a good case for it.

A new race of cooks will have to be developed (of the Girton girl type) before the thermometric control of oven temperatures will become the vogue in the kitchen; and with thermometric control much wrong information is given. But the authors have cajoled themselves that this is not so. On the other hand, they are of opinion that, where thermometers are not used as prescribed, a good deal of guesswork prevails; but the guesswork is made easier by the fact that the electric current "never" varies. Is it possible that Miss Cross and Miss Waterman do not know anything about the variation of voltages in an electric system? It also appears that another thing that, in the view of the authors, confers upon the electric cooker the title to "scientific" is that the oven is not ventilated but is made practically airtight. We cannot bring ourselves to subscribe to the idea that baking or roasting in a steam-supersaturated atmosphere is "scientific."

The authors aver that there are two reasons why an electric-oven is cheaper to use than one heated by coal or gas. One of these reasons is sufficiently covered by the statement that the ovens are air-tight and heavily packed; so that this would not apply to unpacked or lightly packed ovens. The thermal value of gas and electricity for a given price apparently does not enter into the reckoning. The warning, however, is given that if economy is required with the electric-oven the door must be opened as seldom as possible. The second reason adduced is "that meat cooked in an electric-oven loses very much less weight than if cooked in any other way." Of course, this is very silly. It was acknowledged to be so in the discussion on Mr. Cooper's paper before the Institution of Electrical Engineers. Loss of weight in cooking in an oven is entirely a question of temperature and constitution of meat. The authors themselves do not apparently appreciate this, although they, like their readers, may arrive at the conclusion by applying a little common sense to certain points in the book. Users are advised to leave the heating elements of the oven on at full heat for from 15 to 30 minutes before putting in any food. A little later on they are told that beef requires for cooking 20 minutes for every pound, and 20 minutes over; mutton 23 minutes for every pound, and 23 minutes over; veal or lamb, 25 minutes for every pound, and 25 minutes over; and pork, 30 minutes for every pound, and 30 minutes over. "This rule applies to joints of 5 lbs. and over; smaller joints require a proportionately longer time." On the next page, it is stated: "It is quite possible to cook meat in an electric-oven as quickly as in any other oven. By using higher temperatures, only 15 minutes to the pound and 15 minutes over need be allowed." The slower method given above is, however, strongly recommended for the following (among other) reasons: "Many of the valuable juices of the meat are retained which would otherwise be lost." What does this mean if not that the measure of shrinkage has relation to the degree of temperature? It is possible to work a gas-oven at high or low temperatures; and at any intermediate point, which is not the case with an electric-oven. What, then, do the authors mean by their random statement that meat cooked in an electric-oven loses much less weight than if cooked in any other way?

In speaking of economy, the authors omit to point out that something like 70 per cent. of the cooking of a household is done on the hot-plate. Nor do they say anything about the inefficiency of electric hot-plates, the slowness of boiling on them, and their breakdowns. These things were said recently within the four walls of the lecture theatre of the Institution of Electrical Engineers, from which the public are excluded. Perhaps the authors consider that sufficient indirect warning as to the hot-plate is given to users by the statement that "the greatest economy of electric cooking is to be found in the work of the oven." Regarding the grill, the user is urged not to touch the wires with any metal—knife, fork, or spoon—as this might seriously damage the grill. It is too bad of Miss Cross and Miss Waterman to have omitted all reference to the fact that the person handling the metal implement might also show a surprising amount of agility.

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* "How to Cook by Electricity." By Amy Cross and Alys Waterman. London: Lake, Sison, and Brown, Limited. Price 9d.

THE DAVIS COMPANY'S 1915 SERIES OF GAS-FIRES.

Side Ventilating and Other Features.

Always attractive, the sumptuously equipped gas exhibition *salons*, in Oxford Street, of the Davis Gas-Stove Company, Limited, possess at the present moment an additional feature of interest, in the specimens that are on view of the firm's 1915 series of gas-fires, which embrace various improvements calling for note. In drawing attention to the structural details, too, it would be remiss not to state that, from an artistic point of view, the very best effects have been secured in the design of the new season's fires, one pattern or another of which should be found to suit the taste and the needs of the most exacting architect or consumer, as it certainly will harmonize with any scheme of interior decoration.

The Davis Gas-Stove Company remark that, as exhaustive scientific research has demonstrated that the comfort of a living-room is mainly governed by the four factors of air temperature, radiant temperature, relative humidity, and air movement, their 1915 series of fires have been constructed to meet these conditions to the fullest possible extent. Primary convection currents are minimized, and their temperature is substantially reduced. The radiant temperature is under ready control, and is thus made adjustable to varying room conditions. Normal relative humidity is consistently maintained. Air movement is increased by improved ventilating provision, under adequate control, to meet variations in chimney draught and other influences.

Side Ventilating.

To take the last aim first, this is attained by the provision of a ventilating device which carries into effect the view of the firm that any secondary ventilation—that is to say, ventilation other than that which is derived from the canopy itself—should be by means of side panels, with adjustable dampers. The advantage sought by this method of ventilation is to obviate the draught one may be liable to experience, according to the degree of ventilation, when sitting close to any fire ventilated wholly by the canopy. With side ventilation, of course, the draught is at any rate divided in two, one-half at either side of the fire; and the draughts do not pass over the radiants. Furthermore, the secondary ventilation can be entirely shut off, should circumstances warrant this, or it can be regulated to a point of extreme nicety. These operations are performed by the opening and closing of the hinged dampers by means of a sliding knob.

An explanation, with diagrams [taken from a pamphlet just issued by the Company, on "Domestic Heating in its Relation to Personal Comfort"], of the origin and development of the ventilating gas-fire, is reproduced at the close of this article. This is accompanied by the opinion of Mr. A. H. Barker, B.A., B.Sc.—a distinguished heating and ventilating authority—that to allow the secondary air to pass to the chimney by way of side grating-panels controlled by dampers is "vastly superior to the other;" the "other" being the alternative method of ventilating by means of a secondary air passage above the canopy.

The Intense-Flame Burner.

This year's fires differ from their predecessors inasmuch as they have a rectilinear front, whereas a curved front has been the design adopted in former years. This alteration has involved the reconstruction of the burner; and advantage has been taken of the opportunity afforded by this to effect several improvements in it. One of these improvements consists in the placing of what is termed an "intensifying plate" between the lower portion of the burner and the nozzle-piece. This has the effect of dividing the gas into very fine streams and ensuring a complete mixture of gas and air, and therefore silent combustion.

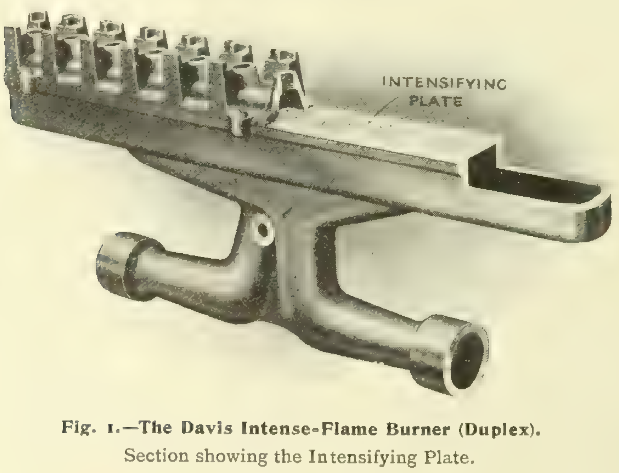


Fig. 1.—The Davis Intense-Flame Burner (Duplex).
Section showing the Intensifying Plate.

A Silent Injector.

To further secure that the gas-fire shall be silent in operation, there have been devised a patent silent injector (which is a new gas and air regulating device), and also a pressure damper, for dealing with any cases of initial pressure other than would naturally produce a silent flame.

The illustration and the following short description will make the working of the injector clear: The small pin A is free to rotate by pressure of the thumb or finger through three-eighths of a circle, and in so doing causes the shield B to rotate also, thus reducing or increasing, as required, the quantity of the gas passing. The spring D ensures that the surfaces B and C shall be in gas-tight contact, and that the pin A shall not rotate except as intended. At E is the air-slide, provided with a locking-screw F. By sliding the disc against or away from the burner-mouth, complete regulation of the aëration is obtainable, making possible the range of efficient flames shown in fig. 4. The gas cannot at any time be shut off at the nipple—the regulator having definite stops at the maximum and minimum positions.

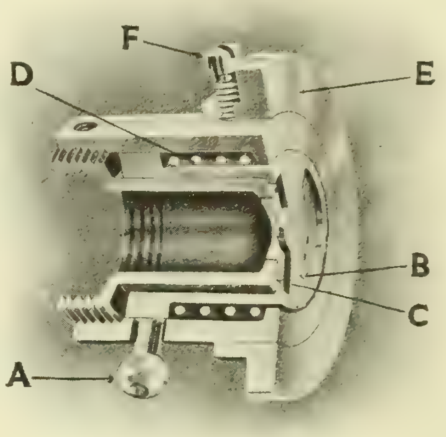


Fig. 2.—The Davis Silent Injector.

The Patent Pressure-Damper.

Dealing in the same way with the patent pressure-damper, it may be explained that the gas enters at A from a cast-iron float, and passes around and through the perforated cone B to the outlet C. The cone B may be caused to slide within the enlarged tube D, by means of the eccentric pin E, operated by the spindle F, which passes through the gland and stuffing-box G, to prevent gas leakage. In this way, the space H, between the cone B and the sloping surfaces of the enlarged tube D, may be increased or decreased [yet always affording a passage for the gas], according to the requirements of the then main gas pressure. The Davis

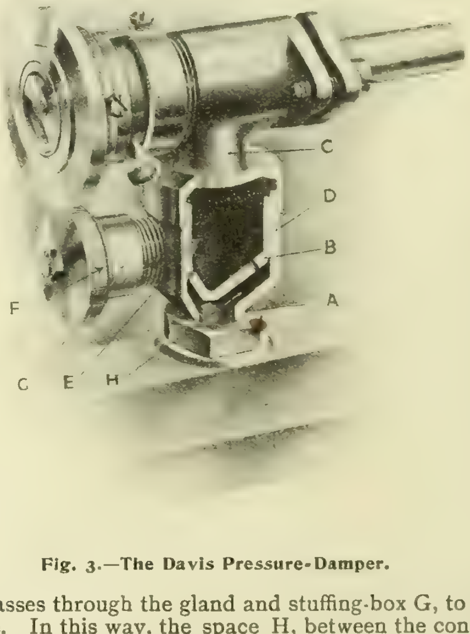


Fig. 3.—The Davis Pressure-Damper.

pressure-damper may to a certain extent also be used to control the aëration of the flames; aëration being lessened as the gas pressure at the injector is reduced, and the size of the latter increased.

The intensifying plate, the silent injector, and the pressure-damper have the combined effect, if the last two are properly regulated, of enabling the adjustment of the radiant intensity of the fire to any conditions under which it may be burning; the view taken by the Company being that the same degree of radiant intensity is not necessary, or even desirable, for every room into which the same pattern of gas-fire may perchance find its way. With the devices introduced, they point out that they can provide a small room, with people seated near to the fire, with a radiant temperature of low intensity, and a larger room, with radiation of very much more powerful intensity from one and the same fire. In fact, they claim for this burner, with the various improvements, that it will give a very wide range of efficient flames. Fig. 4, already referred to, shows such a range of flames. A has a maximum aëration, and therefore most intense flame. It has a small dark cone, and is the lowest of the four flames. B has a slight reduction of the aëration, suitable for large, but not for the largest, rooms. C has further reduction, and is a normal and average flame; while D shows the limit of deaëration, giving a flame suitable for very small rooms, and for sitting close to the fire.

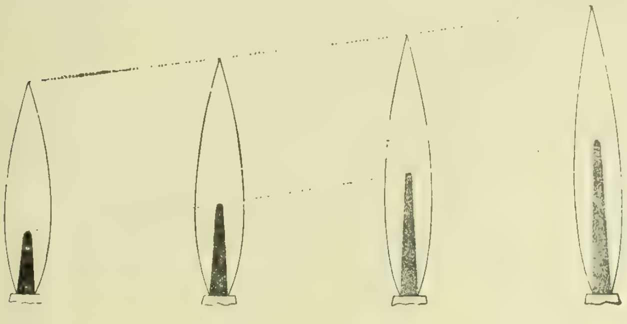


Fig. 4.—Range of Efficient Flames Obtainable with the Davis Intense-Flame Burner.

Another point about the burner is that for the larger fires—ten flame and upwards—a new form of duplex burner is provided, which is controlled by two separate taps; one on either side. In this way, with (say) a ten-flame fire, one can have the whole of the fire burning with any degree of reduction, or six or four flames, and in either case also with any degree of reduction.

From the maintenance point of view, the burner is all that can be desired. It is simplicity itself; consisting, as it does, in whatever size, of only three parts—the nozzle-piece, the intensifying plate, and the main casting.

Alignment of Fuel and Flame.

Reference should be made also to the provision for securing constant and invariable alignment of each pillar of fuel with its own particular flame. Uprights—two (slotted) at the back of each nozzle, and one in front, standardized to fit the fuel, and in which the bottom end of the fuel rests—ensure the absolute maintenance of that alignment with the flame which it is so desirable to secure.

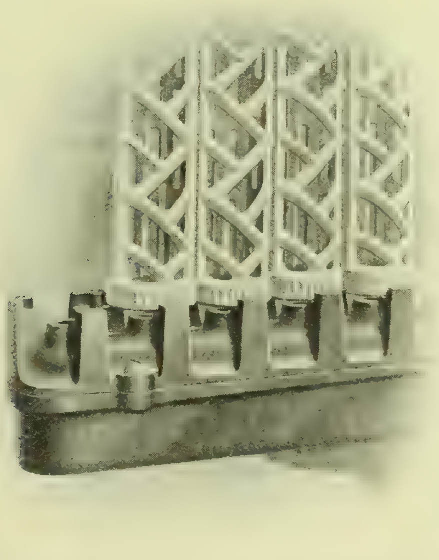


Fig. 5.—Securing Fuel and Flame Alignment.

Built-in Fires.

In addition to the series of 1915 fires embodying the features just described, the Davis Gas-Stove Company have introduced something else which they have every confidence will prove extremely attractive, and in thorough keeping with the modern trend of gas heating. There is, they point out, a growing tendency on the part of architects to specify gas-fires for dwellings about to be erected; and they have designed a set of beautiful fires which, when they are fitted (an operation as simple as can be wished), have the appearance of being part of the fireplace.

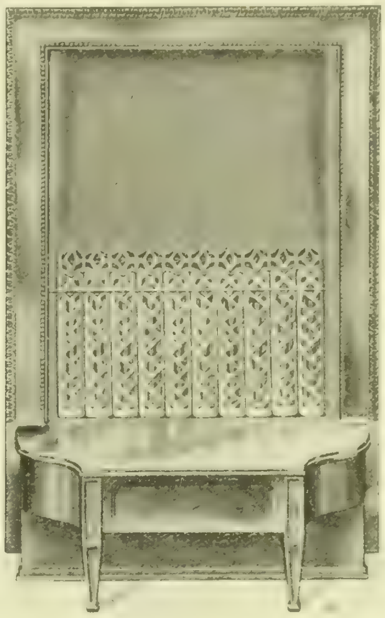


Fig. 6.—The Davis "Adam" Fire.

These fires do not stand out from the surrounding tiles; and they are suitable for any position, being designed to harmonize perfectly with all styles of modern interior decoration, as well as those of earlier well-known periods. No architectural work could be too simple or too elaborate to be matched by one or other of the fires and surrounds which are on view in the Davis Company's *salons*. The requirements of Adam, Tudor, Jacobean, or Georgian styles can each and all be met in a manner worthy of their very best traditions. These flush surface—if they may be so termed—built-in fires gain an added lustre by being fitted with a heavy plated trivet, which gives the effect of an increased radiating surface.

ORIGIN AND DEVELOPMENT OF THE VENTILATING GAS-FIRE.

The following is the extract from the Davis Company's booklet, alluded to in the course of the preceding article:

The First Ventilating Gas-Fire.

The first ventilating gas-fire was made in 1905 by a well-known Yorkshire firm—the idea, however, having been originated by the South Metropolitan Gas Company.

Original Davis Ventilating Gas-Fire.

Shortly after this, we [Davis Company] introduced our first ventilating gas-fire. In this, two passages were provided—both connected with the chimney; one consisting of a flue for the escape of the products of combustion, the other (surrounding the first) a course for the passage of ventilating air, regulated by means of a sliding-damper. This arrangement is clearly shown in fig. 1.

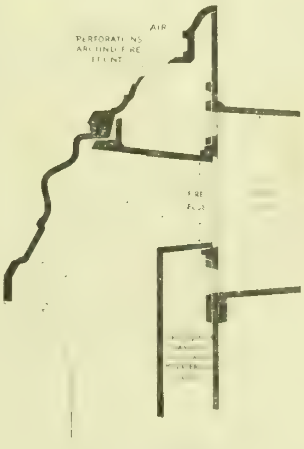


Fig. 1.—Section showing the Construction of the First Davis Ventilating Gas-Fire, 1906.

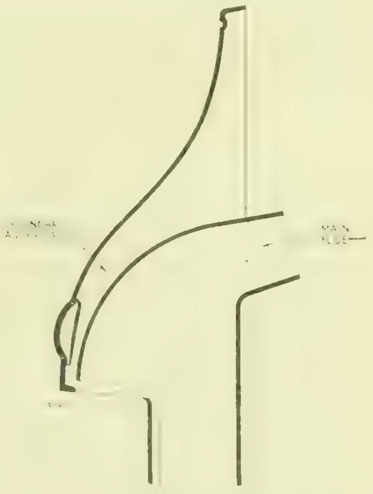


Fig. 2.—Section showing the Secondary Air Passage of the Davis Hygienic Gas-Fire (1911-14).

Ventilation of the Hygienic Gas-Fire.

In 1911, we introduced the Davis series of hygienically perfect gas-fires, in which primary ventilation was assisted by an enlargement of the flue outlet, and a carefully proportioned secondary air-port, was also provided. This construction is shown in fig. 2.

Excessive Canopy Ventilation Undesirable.

Our own later experience, coupled with the research of the best-known authorities, has dictated a re-introduction of the adjustable secondary air passage, with perfections and modifications designed to overcome the objections that might legitimately be raised against an extension of our 1911 principle.

In this, as will be seen from fig. 2, all the secondary ventilating air was introduced at the canopy edge. A mere enlargement of the secondary air passage would, therefore, have the effect of causing an undesirable draught around the front of the fire.

Side Ventilation Preferable.

Exhaustive tests in our own laboratories, as well as the considered judgment of the foremost experts, confirm our view that secondary ventilation, to be perfect, should be mainly effected around the sides of a gas-fire, where its velocity can be kept low, and where it can be adequately controlled.

In this connection, mention is made of Mr. A. H. Barker's emphatic opinion, in reply to the following question: "In the case of a gas-fire which is to change the atmosphere in a room three times per hour, is it more satisfactory to cause the whole of the ventilating air to enter the chimney beneath the canopy, or to allow a large portion of it to pass to the chimney by way of perforations through the side of the fire—in the latter case, arrangements being made for adjusting dampers controlling the amount of secondary air passing?" Mr. Barker's emphatic reply was: "I have not the least hesitation in expressing my opinion as entirely in favour of the second proposal—namely, to allow the secondary air to pass to the chimney by way of the side grating panels, controlled by dampers. In my judgment, this proposal is vastly superior to the other."

Side Ventilation with Adjustable Dampers.

In the Davis 1915 gas-fires, ventilators with adjustable dampers are fitted at either side of the fire, and being operated individually, permit of a wide range of adjustment by the simple operation of moving a sliding knob backwards or forwards, in this way opening or closing the dampers, according to the degree of ventilation required. Figs. 3 and 4 illustrate this new and improved arrangement.

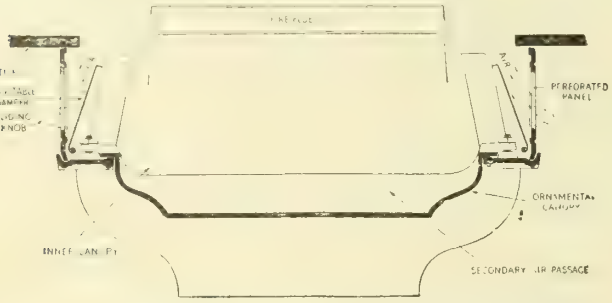


Fig. 3.—The Davis 1915 Gas-Fire Construction. Plan showing the Side Ventilating Arrangement and Adjustable Dampers.

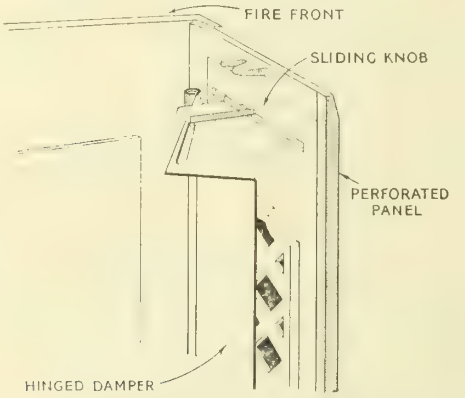


Fig. 4.—The Davis 1915 Gas-Fire Construction. Section showing the Operation of the Hinged Damper.

English Coke for France.—At last month's sitting of the Central Coke Committee for France, the stock of coke on the 1st of July last, excluding the districts in the East, North, and North-West, was stated to be 149,532 metric tons, compared with 169,115 tons at the corresponding date last year—a decrease of 19.583 tons, or 11·5 per cent. The Committee took into consideration the question of the importation of English coke into France, in order to meet the requirements of manufacturers who are engaged on work connected with the war, and to prevent the domestic consumers from being deprived of a supply of this useful fuel during the coming winter.

WATER LEGISLATION FOR 1915.

[First Article.]

In preceding issues of the "Journal" the principal features of the Gas Acts and Provisional Orders for the present session have been indicated. We now deal with the measures relating to water supply—taking first those promoted by companies.

The Frimley and Farnborough Water Act confers further powers upon the Frimley and Farnborough District Water Company. Under section 15 of their Act of 1909, the quantity of water to be pumped from the well at Odiham was restricted to 500,000 gallons per day. By the present Act this is increased to a million gallons; and the Company are not to be liable to any penalty or proceedings in respect of any day in which they shall exceed this quantity, if the excess is rendered necessary "by military requirements within the limits of supply of the Company during the continuance of the present war and two years thereafter, or by the temporary breakdown of the Company's Itchel pumping-station." Section 27 of the Act of 1909, dealing with cases where existing wells are affected by pumping operation, is amended; and it is provided that if it shall be proved that pumping at the station specified in the section has caused any diminution of the supply in any private well existing at the time of the passing of the Act, or constructed before March 1, 1915, and in either case situated within a radius of three miles from the station, the Company are, upon the written request of the owner, lessee, or occupier of such well, to afford him a supply of water equal to the amount of the diminution, and repay to him any outlay incurred in obtaining his supply in consequence of their boring operations. After the passing of the Act, the water supplied by the Company is not, except in case of accident or breakdown, or with the consent of the Local Authority, to exceed 12° of hardness according to Clark's scale. Authority is given for any urban or rural district council whose district is wholly or in part within the Company's limits to guarantee payment to them of the cost of laying down any pipes for the supply of water in the district. Water for carriage or motor washing or for stable purposes is to be charged for at a rate not exceeding 20s. per annum. The Company may raise additional capital to the amount of £40,000, inclusive of premiums; and it will carry 7 or 5 per cent. according as it is issued as ordinary or preference capital. The latter is not to exceed £20,000. Power to borrow to the extent of one-fourth of the new capital, and to create debenture stock, is given. The Directors are authorized to appoint a Managing-Director and to determine the Secretary's remuneration. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

Authority is given to the Southend Water Company to raise additional capital to an amount not exceeding £250,000 by the issue of new shares or stock, create and issue debenture stock, and borrow to the extent of one-third of the new capital raised at the time of borrowing. The Company are not to raise or borrow any money during the continuance of the present war, and twelve months thereafter, without the previous consent of the Treasury. The dividend on the additional capital, whether issued as ordinary or as preference, is limited to 5 per cent. The Company propose to construct seven pumping-stations, to be situated in the parishes of Hockley, South Fambridge, Canewdon, Paglesham, and Canvey Island, and a tunnel in the parish of Fobbing; and they are granted fifteen years for their completion. As in the Frimley and Farnborough case, authority is given to any urban or rural district council whose district is wholly or in part within the Company's limits to guarantee payment to them of the cost of laying down pipes to supply water in the district. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The South Staffordshire Water Act confers upon the South Staffordshire Water-Works Company power to extend their limits of supply so as to include a number of parishes in the rural district of Cannock, in the county of Stafford; also to construct new works, consisting of two wells and pumping-stations in the parish of Brewood, and two pipe-lines in connection therewith. Seven years are granted for their completion. Additional capital to the amount of £150,000 (including premiums) may be raised, the dividend on which is to be 7 or 5 per cent. per annum according as it is issued as ordinary or preference. Power is given to borrow to the extent of one-third of the new capital, and to create debenture stock. In the case of water supplied for domestic purposes being used in stables by means of a hose-pipe, the Company are authorized to charge any additional sum not exceeding 20s. per annum. The Act contains a large number of protective provisions applicable to certain specified bodies and to owners of existing wells affected by the Company's pumping operations. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

In the Bill promoted by the Sutton District Water Company they sought authority to construct additional works, consisting of a well or wells and pumping-station in the parish of Cheam, in the rural district of Epsom, and a conduit or pipe-line connecting it with a service reservoir to be built in the same parish. Capital was applied for to the amount of £250,000, including premium, with the usual power to borrow to the extend of one-third. The Company, however, abandoned their scheme for new works, and reduced to £180,000 the amount of additional capital they applied for. The Act consequently contains this figure, with the customary borrowing powers; but the Company are not to raise or borrow money during the continuance of the present war and twelve months afterwards without the previous consent of the Treasury. [*Parliamentary Agent: Mr. J. Kennedy.*]

The Weardale and Consett Water Act empowers the Water Company to construct additional works of an extensive character. The powers conferred by the Weardale Act of 1902 to make and maintain the Burnhope reservoir, and aqueduct terminating therein, a tramroad, as well as a road diversion, all in the parish of Stanhope, in the rural district of Weardale, in the county of Durham, are revived; and additional powers are granted for the construction of three intakes, &c. For the completion of certain of the new works specified, the Company have been granted fifteen years, and with regard to the other works five years, from the passing of the Act. The existing capital is to be applied to the purposes of the Act; but section 55 of the Act of 1902, relating to the raising of additional capital, is amended by the reduction of the amount specified therein from £840,000 to £440,000; and the Company are restricted to six years for the payment of any back-dividends. The Act contains the provision already referred to restricting the raising of money during the war. From and after the quarter-day which shall next happen after the Company have obtained from the Board of Trade a certificate that they have expended not less than £120,000 on the new works authorized by the Act and the necessary lands therefor and for the works in respect of which the powers are revived and the costs of the Act, or some of such purposes, the Company may charge for a supply of water for domestic purposes the following rates, in lieu of those now in force: Where the rateable value of the house, or part of it, does not exceed £7, the sum of 12s. per annum; where it is above £7, the rate of 10 per cent. per annum of the rateable value—in each case with extras for an additional closet and a bath. When £200,000 have been expended on the Burnhope reservoir, the Company are to allow a rebate of 10 per cent. on the above-mentioned rates for water, and 5 per cent. when it has been completed. [*Parliamentary Agents: Messrs. Torr, Durnford, and Co.*]

The West Gloucestershire Water Company have obtained legislative sanction for the amendment of the borrowing powers they possess under their Acts, so as to limit the amount to one-third of the capital raised at the time of borrowing, and for authority to raise on mortgage or by the issue of debenture stock such sums as, with the aggregate amount raised at the date of the passing of the Act, will make £86,666 in all. The Act contains the usual provision restricting the raising of any money during the war. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

THE PRODUCTION AND RECOVERY OF TOLUENE FROM ILLUMINATING GAS.

By a Gas Engineer.

In the "Journal" for the 7th inst., pp. 502-3, appears a very interesting article on the above subject, from the point of view of the coke-oven expert. But the urgent need of toluene for the manufacture of explosives is at the present time taxing also the ingenuity of all engineers of coal-gas works.

The removal of the benzol series of hydrocarbons from the gas raises those dread spectres, "Low calorific value, naphthalene trouble, and consequent possible loss of consumers." This question is therefore of the greatest importance, and presents the following problems:—

1. The quantity of benzene which must be left in the gas to give it the necessary calorific value and illuminating power for the particular district and to prevent the deposit of naphthalene.
2. The possibility of increasing the hydrocarbons in the gas without a decrease in the volume of gas made per ton of coal carbonized.
3. The best and most suitable method of recovery of the toluene which allows the benzene vapours to remain in the gas.

As to (1), many modern works, with high temperature and consequent high yields, strip their coals and partially decompose the hydrocarbons in the gas, and therefore, unless the temperature of carbonization is reduced, there is no margin of hydrocarbons in the gas for washing.

As to (2), in ordinary methods of carbonization, to increase the yield of toluene, either a lower temperature, with a consequent decrease in the volume of gas made, or the purchase of a better class of coal is necessary. Recent experiments have shown that it is possible by the use of a catalyst during carbonization to considerably increase the volume of hydrocarbons in the gas, and also to increase the volume of gas made per ton of coal carbonized. This method provides a margin of toluene in the gas for washing without loss in calorific value.

As to (3), numerous suggestions have been made relating to the washing of the gases by creosote and tar. In considering this problem, the capacities of the respective plants and conditions of working must be taken into account; also the capacity of the washing medium for absorbing the product required to be recovered from the gas.

In modern coking practice a carbonizing capacity of approximately 40,000 tons per annum is supposed to be the minimum at which a benzol-recovery plant is profitable. Of about 1600 coal-gas works in the United Kingdom, it is estimated that the greater number carbonize from 1000 to 10,000 tons per annum.

The conditions of working between coke-oven and gas-works plants are totally different. The primary object of the coke-oven engineer is to make coke. The illuminating power of the gas made is of no consequence to him; and the average calorific value is much lower than that of coal-gas works. The coal-gas engineer has to work to standards in calorific value and illuminating power, and to distribute gas of the specified standard over large areas.

With plants working under coke-oven conditions there is not the slightest doubt but that creosote is the ideal medium for washing —this being proved by its almost universal use in these plants. The case is quite different in coal-gas works, where a much less quantity of coals per day are carbonized, and where the slightest deficiency in illuminating power, or the expenditure of new capital, has to be seriously considered.

Taking a works carbonizing 10,000 tons per annum, we may examine:

1. The relative advantages of the different methods of washing.
2. Proposals for increasing the percentage of toluene in the gas and tar as applied to coal-gas works.

Creosote Washing.

As to the advantages. Washing with creosote presents a possible yield of 3 lbs. of toluene per ton of coal carbonized, by reason of the gas being totally stripped of the benzol series. The disadvantages of creosote washing are: (*a*) Owing to the large quantity required, approximately 2000 gallons, it would be necessary to put up a complete plant to debenzolize the washing oil, in addition to the washing and fractionation of the benzols recovered. The cost of such plant would be about £2000. It is very doubtful if the makers would guarantee that a plant of this size would pay its working costs. (*b*) The calorific value of the gas would be reduced by 8 per cent., and the illuminating standard reduced to 9 candles. (*c*) The naphthalene difficulty would be considerable.

Washing by the "C" Process.

The advantages are: (*a*) The tar for washing, receiving, and storage tanks, and washing apparatus are in most cases already on the works, requiring little or no capital outlay to put into operation. (*b*) The gas can be washed to meet the calorific value and illuminating power required for the particular district. (*c*) The tar required for washing is much less in quantity, owing to its higher specific gravity, and consequent greater affinity for oils of the higher boiling points. (*d*) The cost on capital account and in working the process is practically *nil*. (*e*) It is equally efficient at works of any capacity, from the smallest to the largest.

The disadvantages are: (*a*) The percentage of toluene recovered is lower, owing to the partial combination of the toluene with the tar. (*b*) Deposit of naphthalene in the mains. This may, however, be avoided by removing the toluene fraction, and allowing the light benzols to pass along with the gases during washing.

The losses of toluene due to its partial combination with the tar can be overcome by the use during the process of carbonization of the coal of a catalyst which causes the production of a tar of a different composition, more fluid in character, and which does not retain so large a percentage of the hydrocarbon oils.

We may, therefore, concede that while creosote is specially suitable for coke-oven practice, yet for most coal-gas works it is commercially impossible, and does not possess sufficient attraction to gas engineers.

They, however, have not been idle on the question of increasing the percentage of toluene in the gas and tar, and numerous proposals with this end in view have been tried at many works with varying degrees of success. Professor Leo Vignon has shown by his researches on carbonization of coal that carbon monoxide reacts with lime under certain conditions, forming hydrocarbons and carbon dioxide, and that the methane present in small proportions in water gas owes its presence to the catalytic action of lime contained in the coke.

Catalytic Properties in General.

The part which a catalyst plays during the reactions is shrouded in mystery. A catalytic agent according to Berzelius is a substance which merely by its presence, and not through its affinity, has the power to render active affinities which are latent at ordinary temperatures.

The following, however, are generally recognized "articles of faith": 1. The catalyst has the same chemical composition at the beginning as at the end of the reaction. 2. A small quantity of the catalytic agent is sufficient to effect the transformation of an indefinitely large quantity of reacting substances. 3. The activity of the catalytic agent depends on its physical condition; the finer its state of division, the greater will be its chemical activity. 4. The catalyst is not in the same physical state after the reaction is over. 5. The catalytic agency takes place in the presence of water vapour; the latter acts the part of a carrier. 6. A catalytic agent is not capable of starting a reaction; it can only modify the velocity of the reaction.

The advantages of limestone as a catalytic agent are: 1. Its capacity for absorbing heat under certain conditions, and decomposing at a low temperature into nascent calcium oxide and carbon dioxide. 2. The calcium oxide, upon being freed from its neutralizing agent, is much more chemically active than caustic lime, and attacks and decomposes the organic matters and bases contained in the coal, thus splitting-up and liberating the primary products of carbonization at an earlier period of carbonization. 3. The calcium, being in a pure finely-divided state, possesses all the known properties of a good catalyst, which by its reactions assist according to their affinities the combination of oxygen and hydrogen, forming water, and hydrogen and carbon forming hydrocarbons. 4. The calcium, after its chemical and catalytic properties have been utilized, combines with a portion of the sulphur liberated by the decomposition of the iron sulphide and the ash-forming materials fluxing with them at a lower temperature, and produces a more fluid slag, which binds the carbon into a firm hard coke.

The "Synthetic" process, in which limestone is used as a catalyst in the carbonization of coal, possesses great possibilities, and lends itself specially to the "C" process of washing at coal-gas works. The toluene content in the gas and tar is greatly increased, and other commercial and working advantages have been noted during a period of three months at a medium-sized modern works using this process.

Gas.—An increase in the quantity of gas made per ton of coal. An increase in the calorific value of the gas. A sensible decrease in the quantity of sulphur compounds. Less deposit of naphthalene in the services. Less deposit of graphitic carbon on the inside of the retorts.

Tar.—A much more liquid tar, containing a greater quantity of the higher aromatic hydrocarbons. No pitched hydraulic mains, and comparative freedom from blocked ascension pipes.

Coke.—An increased yield of larger saleable coke, consequently a decreased quantity of breeze. The quality of the coke is very much improved.

Ammonia.—A sensible increase in quantity.

Toluene.—The quantity of toluene recovered from the tar after washing the gases was increased over fourfold.

[In next week's issue we may have some definite particulars for publication relating to the "Synthetic" process referred to in the above article. Meanwhile attention may be specially directed to a reference to the matter in the editorial columns. —Ed. J.G.L.]

THE GAS-FITTER—WANTED A DEFINITION.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

One of the standing difficulties that has always beset the Council of the Institution of Gas Engineers is the heterogeneous character of its members, who are gathered from every grade of society—from the labouring class to the plutocrat. At one end of the scale there is the manager of a village gas-works, who may possibly have entered the service of the company whose affairs he now superintends, as a yardman, or stoker, and gradually worked his way up. He has seen very little of the gas industry outside his own sphere, and never enjoyed the advantages of technical education in any form, as unless within easy hailing distance of some educational centre—such as London, Manchester, Birmingham, &c.—the small man might just as well be in the Colonies so far as opportunities for attending good evening classes are concerned. But he is a regular student of current technical literature, and has collected by degrees a small technical library; while the fact of having acquired it by careful saving and scraping, ensures a more thorough usage than is sometimes the case with owners of an extensive library collected by the exertions of others. His ideas are naturally somewhat cramped, because he rarely has the opportunity of visiting other gas-works or associating with other managers. At the other extreme, we have the engineer and manager of a gas-works of the first magnitude who has received the highest technical instruction that the educational resources of the country can supply, followed by pupilage under a leading authority, and is probably familiar with all the large and important modern gas-works, not only in England, but in Europe. These extremes are not separated by any sharp dividing line, but by all sorts of graduations as between one and the other. Many of the members have sufficient training and experience as civil engineers to discharge the duties of engineer and manager in the fullest sense of the word. Others are managers only, or perhaps more in the way of a superintending accountant; the technical part being cared for by a consulting engineer. There is a great divergency between the duties respectively discharged by the manager and the secretary, or by a technical managing director. The roll of members comprises, therefore, a motley assemblage, having very little in common in respect to technical and commercial ideals, education, habits of life, and so on. It is no wonder then that the Council find it impossible to please everybody.

Similar lack of homogeneity applies to the gas-fitter, as he is generally understood. The word does not cover so wide a range in the social sense; but it comprises many different varieties of training, environment, education, and ideals. The older men have had no technical education other than the traditions of the trade, as acquired by acting as fitters' mate. The younger, with the reservation above referred to, have been able to attend technical institutions fitted with laboratories and workshops. So much is written and said about the desirability of improving the gas-fitter that it is scarcely possible to find a number of a current gas magazine that is free from some reference to the subject. While there is general agreement as to the necessity, or at least the desirability, of improvement in sympathy with the increased call on the gas-fitters' tact and technical ability, brought about by the multiplication and refinement of appliances for consuming gas, there is no uniformity as to the status and present position, or the precise direction that the lines of improvement should follow. There is too much use of general terms—such as improvement, better education, &c.—to which scarcely any two persons attach exactly the same meaning, and not enough clear reasoning as to the components of a competent gas-fitter. Nebulous and indefinite ideas as to the improvement of the gas-works manager were in existence for at least a quarter of a century before the thing took concrete shape; and until something is done in the way of a definite curriculum and classification of the duties—for there is quite as much difference between house carcassing and complaints as between gas manufacture and distribution—the workers in this important cause of elevating the gas-fitter will labour under much disadvantage.

A speaker at a gathering of gas engineers, having occasion to refer to the gas-fitter, naturally has in view the characteristics of the particular individuals of the class with whom he is immediately associated; as even if he does not follow the general practice of undertaking all kinds of gas-fitting work, he must have the services of a fitter to attend to the fixing and removal of apparatus on hire and to complaints. But in a large works the manager himself does not come into daily contact with the workers in the fitters' department, which is placed under a special superintendent. In other respects the position of the fitter varies according to the size of the undertaking. In a small town one man may be able to do the whole gas-fitting, apparatus on hire, and meters; and he probably is left to a great extent "on his own"—the only supervision being that exercised by the secretary or manager, who possesses nothing more than a general knowledge of the practical details. Work of especial importance excepted, the fitter will probably be expected to see the job through from first to last, including taking instructions, getting out estimates, deciding sizes of pipes and description of gas-fittings, laying-out the job, and measuring-up after completion.

It is under these circumstances, perhaps, that the need for a man of good education and address is more evident than in a larger town where a large staff of fitters are employed, as the greater part of the work above alluded to, other than the mechanical execution, is arranged by a practical superintendent and his assistants, or covered by fixed rules. The gas-fitter may well be a smarter and neater workman under these circumstances, but he need not be qualified to act as a district inspector. The same applies to repairs and complaints. In the small town, the fitter is expected to tackle and remedy all troubles single-handed; but in the large district these matters are under the control of special officers. One great drawback in regard to small districts, speaking, of course, in a general way only, is that the directorate are apt to cover their technical deficiencies by a rigid and unreasonable economy in respect to wages. In the larger works there is more willingness to pay a rate of wage proportioned to the skill and ability of the recipient; but the small directorate has not yet grasped the fact that, if their business is to be developed to the best advantage, they require the service of a gas-fitter who is worth something more than the local rate of wage. It is evident that at least two different sets or courses of study, examinations, and certificates, are necessary to cover the whole of these requirements. A gas-fitter may specialize in new work or in complaints and repairs, or in both if so disposed. It would seem that the day is rapidly approaching when his work might with advantage be further divided, and he might specialize in one department only—such as cooking, gas-fires, engines, water-heating, &c.

The subject is not complete if we omit the consumers' definition of a gas-fitter. In the small district the gas-fitter is, or should be, regarded as a guide, philosopher, and friend in regard to all matters connected with the consumption of gas. But even in the largest districts, there is an impression among the consumers that one is more likely to get disinterested advice from the workman than from the canvasser or inspector, who is supposed to be directly interested in making a big job. The fitter is closely cross-examined in respect to complaints of overcharge, &c., or by the user of a set of fittings that have been in existence for the last fifty years, and also were not properly set out in the first place, with a view to eliciting some statement that will support the theory that it is not the consumer's fittings that are at fault, but the mains, the pressure at the works, or anything in the world that does not touch the consumer's pocket. The fitter is also questioned as to the economy or otherwise of cookers, fires, engines, and other apparatus. It would be a help to the management to obtain an authentic list of the questions addressed to a gas-fitter in full employment (say) in the course of a month. During discussions with customers, how often the gas manager or salesman finds that the consumer's opinions have been greatly biassed by information received "from one of your men," and that the same anonymous individual is prepared to certify that the customer "could not possibly have used so much gas." No amount of technical education will compensate for lack of tact and good address on the part of the gas-fitter, who should never under any circumstances indulge in criticism of the management, or draw on his imagination for answers to questions that are really outside his department.

GERMAN HYGIENE APPLIED TO GAS.

A CRITICISM OF PROFESSOR M. VON GRUBER'S WORK.

By W. J. A. Butterfield, F.I.C., Assoc.Inst.C.E.

(*Concluded from p. 569.*)

The Analytical Methods Employed.

Professor von Gruber states that the greater number of the determinations of carbonic acid in the air of the rooms which were carried out in the course of the research were made with Dr. Haldane's apparatus, to the convenience and accuracy of which he bears testimony. There is, however, an opportune confirmation of the writer's earlier comments on the German professors' lack of knowledge of external researches and analytical methods in the statement of Professor von Gruber that he believes that the research which he describes affords the first instance of the use of this apparatus on a considerable scale in Germany. Since the apparatus in question was described fully, and its convenience and accuracy demonstrated, in the Blue-Book on the Ventilation of Factories and Workshops which was issued in 1902, and in the following year in the "Journal of Hygiene"—a journal with which presumably a Professor of Hygiene would be well acquainted—while particulars showing the extensive use which had been made of it up to 1909 were given by the writer in the "Analyst" of that year, it certainly is a little surprising that only now has it received recognition in Germany, though admittedly there is no other apparatus in use there which serves the same purpose. It was employed by Dr. Samuel Rideal in the series of investigations on the "Relative Hygienic Values of Gas and Electric Light" on which he reported in 1908 [see "Journal," Vol. CI., pp. 613, 686], which investigations had the same object as the present series by Professor von Gruber. It would almost seem, however, that Professor von Gruber was ignorant of Dr. Rideal's work, since he does not refer to it, and writes as though he were not aware that an investigation more exhaustive than his own had already been carried out. Nevertheless, Dr. Rideal's researches were described by him in great detail in the "Journal of the Royal Sanitary Institute"—another journal with which a Professor of Hygiene would presumably be familiar. In no particular, in the writer's view, were Professor von Gruber's researches as well conceived and as well carried through as Dr. Rideal's, while his inferences and deductions can almost all be challenged as unsupported by the results obtained; whereas Dr. Rideal's scientific instinct and good judgment prevented him drawing any deduction which could not be fully sustained.

Apropos of Professor von Gruber's analytical work, in several instances a determination of the oxygen content of the highly-fouled air which he had from time to time in his experimental rooms would have thrown useful light upon the other results of the observations. He does not, however, report any determinations of the oxygen content of the air. Perhaps he made none, because he may not have been aware of the rapidity and ease with which these determinations can be made by Haldane's apparatus for the analysis of mine air. A series of such determinations of oxygen in the air of a chamber of which the ventilation was at times purposely restricted were made by Haldane, Trotter, and the writer in the course of researches on the effect of variations in atmospheric conditions on the light of flames [*vide* "Journal," Vol. CXV., p. 288]. No difficulty was experienced in making these determinations rapidly *in situ*, though if Professor von Gruber had found any difficulty in doing likewise he could readily have taken samples of the air for subsequent analysis. Certainly Professor von Gruber is rash in assuming that the determination of carbonic acid in the air is sufficient guide to its influence on the ventilation and lighting of rooms, if in some cases the carbonic acid is added from a bottle of the compressed gas, in others formed by the combustion of coal gas, and in others produced by breathing. Variations in the oxygen content of the air are of greater significance than variations in the content of carbonic acid except in the effect of the changed composition on beings breathing the air. In regard to human beings, it has been well established by physiological researches that any proportion less than 100 volumes of carbonic acid per 10,000 is of no importance in air at ordinary pressure, provided no other harmful impurity is present. If the breathing is not increased by heavy muscular work, a much higher proportion of carbonic acid in the air causes a scarcely noticeable subjective effect. In the researches on the light of flames already referred to, the writer found that even 250 volumes of carbonic acid per 10,000 of air caused him no discomfort.

Effect of Carbonic Acid on the Volume of Air Breathed.

It may be pointed out that Professor von Gruber apparently spent a good deal of time in proving a fact which has been well known for some years to physiologists (in England at least). The results of the series of tests reported by him in Table II. [*ante*, p. 451] show that the volume of air breathed by the human being increases with the proportion of carbonic acid in the air inhaled—other conditions being unaltered. This fact will be found stated in modern English text-books on physiology; and had he and his colleagues been as well informed as they should have been before undertaking a research of this kind, they would not have wasted time on furnishing indifferent proofs of an already well-known physiological fact. In English works on physiology clear statements, based on experimental data, such as the following from Dr. Haldane's writings, occur:

> "If carbonic acid is present in the air inspired, the effect is to make the breathing deeper, and finally also more frequent."

And, again:

> "The breathing is, in fact, so regulated as to maintain a constant percentage of carbonic acid, 5·6 per cent. on an average, in the alveolar air. If the production of carbonic acid in the body increases, as during muscular work, the breathing at once increases sufficiently to keep the alveolar carbonic acid percentage almost constant. If carbonic acid is present in the inspired air, a similar effect is produced. Thus if 2·8 per cent. of carbonic acid were present in the inspired air, the breathing would be nearly doubled; since it would take twice as much of the inspired air to keep the alveolar carbonic acid percentage at about 5·6 per cent.

Apparently, however, Professor von Gruber and his physiological colleague were unaware of these facts, and started on, to them, quite novel experimental ground, in order to ascertain them. They did all this, too, merely to confute a German "authority," who was even more ignorant of the physiology of respiration than themselves.

Fundamental Faults in Von Gruber's Research.

Apart from his want of knowledge of the work of other investigators, and his failure to interpret properly the results of his own work, Professor von Gruber committed some very serious errors of judgment in the selection of the experimental rooms and in the general arrangements for the comparative tests. The rooms purported to be typical of those which would be occupied by members of the less well-to-do classes; but even in Germany—a country where size of rooms counts for more than their number—rooms 20 feet in length can hardly be regarded as fulfilling this condition. The room had only one window—at one end—the frame overall measuring about 4 feet by 6 feet. It seems probable from the drawings that this was a double window. With only one door, at the opposite end of the room, and with a close oak flooring, doubtless waxed and polished, it is not surprising that the ventilation of the room, with window and door closed, was negligible. We are not told anything about the ceiling; but a covering of varnished paper would be in keeping with the style and class of room. The writer cannot agree that this room is typical of those occupied by the less well-to-do classes, even in Southern Germany; and when Professor von Gruber asserts that his researches made in it show that Pettenkofer had much over-estimated the natural ventilation of ordinary living-rooms, he is in reality passing condemnation on his own research. However this may be, investigations made in such a room are practically valueless for throwing light on the hygienic aspects of gas lighting in the living-rooms of the less well-to-do classes in Great Britain.

Suggestion for a Conclusive Investigation in English Conditions.

It is, however, not improbable that some of Professor von Gruber's conclusions may be quoted in this country by persons who do not know how little weight really attaches to them, and that gas lighting may thereby be deemed to be less good hygienically than it really is. It is highly desirable in the interests of the public that the gas industry should take immediate steps to counteract any such wrongful aspersions on gas lighting. Many lectures by Professor Vivian B. Lewes—who is a striking exception to the rather sweeping charge which the writer, with Germany foremost in his mind, earlier levelled against professors as consultants—supply data and facts which might be quoted again with great advantage. Then Dr. Samuel Rideal's research (reported on in 1908) provided a mass of information which somehow appears to have escaped proper utilization by the gas industry. But it may reasonably be argued that the room used by Dr. Rideal was scarcely representative of the average living-room, and in a few respects his investigations were admittedly uncompleted. The publication of the account of Professor von Gruber's work, which was undertaken on behalf of the German Association of Gas and Water Engineers, suggests that the British Commercial Gas Association, or the Institution of Gas Engineers, or other appropriate body, should take steps to have a series of authoritative and conclusive investigations made on the hygienic aspects of gas lighting in average living-room conditions in this country. A full account of the investigations must be published, in order that possibly hostile criticism may be forestalled; but it is of paramount importance that the rooms used and their equipment, occupancy, &c., should be fairly representative of living-room conditions with the less well-to-do classes in this country. Further, the conclusions should be drawn from the data obtained without bias or reservation, but these conclusions should all be summarized in pithy, straightforward language, which will rivet the attention of people who have no special acquaintance with technical or medical terms.

The writer, in conclusion, ventures to suggest the style of room which seems to him fairly representative. This is the ground floor sitting-room of the modern suburban cottage, of a rental value of £25 to £40 a year, according as it may be in the Provinces or in the London suburbs. It will usually have a small bay window, and, of course, a fire-place, and will be about 10 feet square. Two such rooms should be used, in adjacent and symmetrically disposed cottages—either a pair of semi-detached, or two adjoining cottages in a terrace. Both should be fitted with a simple modern inverted gas-burner of appropriate size, and with a modern metallic filament electric lamp. Every trial should be made in duplicate simultaneously, the only difference being that when one room is lighted by gas the other is lighted by electricity. Further, each trial—with very few exceptions—should be repeated next day, merely reversing the mode of lighting the rooms. In this way the effects of otherwise uncontrollable differences of location or environment, which cannot always be foreseen, can be eliminated. The rooms should be decorated and furnished according to their class, but identically, and the decoration should not be new—rooms which have been in careful occupation for about a twelvemonth might well be chosen. The back rooms and passages should be available for the observers, and it would be a great advantage if a door were provided giving direct access from the back room of one cottage to the back room of the other. There are many other points—such as the heating of the rooms, which must be considered without bias, for an attempt to combine an investigation of the hygienic aspects of different modes of lighting with one of different ways of heating would probably end in inconclusive results being obtained in both branches of investigation. The investigations, even in the hands of consultants thoroughly familiar with the class of observations required, could hardly be completed satisfactorily in less than a twelvemonth. The work, however, ought to prove of great ultimate benefit to the public. The writer believes the gas industry should gain much from it, and has absolutely nothing to fear from competent investigators, whether briefed by it or by a public or state authority.

THE MONO-RAIL TELPHER.

ITS INSTALLATION, CARE, AND MAINTENANCE.

By H. C. WIDLAKE, M.J.Inst.E., of the Plymouth and Stonehouse Gaslight and Coke Company.

(*Concluded from p.* 502.)

REPAIRS TO MOTORS.

IN view of the fact that the mono-rail telpher as manufactured by Messrs. Strachan and Henshaw readily lends itself to the removal of both the travelling and the hoisting motors, the writer has no hesitation in declaring that no really serious repair or overhaul can be effected on these motors *in situ*. It is his experience that the time and labour incurred in the removal of the motors bodily from the machine to the electrical repair shop are more than saved by the greater rapidity with which the necessary repairs can be effected there and the more satisfactory nature of the job.

Where it is necessary to remove an armature, for instance, the greatest care is necessary in the withdrawal of it in order to ensure that the conductors and the commutator are not injured, and under none, save the most unusual conditions, should this be undertaken on the machine. The motor itself is a robust machine, and can be handled to a certain extent roughly in being swung out and lifted back into position. To put it plainly, it is, as a whole, admirably adapted to withstand the rather rough-and-ready methods of the average gas-works handy man; but its component parts, to which so much injury can be done with a minimum of carelessness should never be entrusted to the handling of this individual.

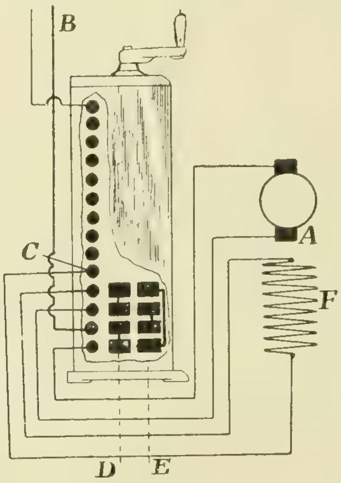
With a telpher plant constantly in use, the machines should be laid-off for a couple of days every eight or nine months, and the motors removed to the electrical repair shop and taken adrift. Bearings should be tested for clearance and replaced if necessary; while if spare armatures are kept, it will be wise to run them alternately. On some telphers the motors are mechanically and electrically interchangeable; and it is only necessary to keep one spare armature. On the plant under the writer's care, the two motors have run for three years with no other repair than a periodical overhaul and the changing of an armature.

The "C" type of Siemens' motors supplied with Strachan and Henshaw's telpher plants have four bushed holes at their sides through which the armature and field conductors pass; and it is invariably these conductors that suffer if the motor is handled roughly in slinging out. To do away with this possibility, these holes can be plugged up and four ¾-inch holes drilled through the top of the motor carcase between the end shield and the brush gear. These holes can be bushed and fitted with four terminals passing through the insulated bushing, and connected inside the motor to their respective points by strip copper connections. On the plant at the Plymouth and Stonehouse Gas-Works this small alteration has given the greatest immunity from trouble of this sort, and has also been carried out on the Fiddes-Aldridge machine motors. Fig. 10 [*ante*, p. 575] showed the inverted selenoid brake of the hoist motor; it also gave a view of the terminals with the cables and thimbles connected.

TELPHER WIRING.

The wiring of the machine should be maintained in an efficient condition and be carefully inspected from time to time, in order to detect any weak places where the insulation has been frayed or perished. Faults from this cause should be comparatively rare if the work has been carried out in a proper manner. No wires should be allowed to lie about loose on the machine, but the whole of the motor, controller, and resistance leads should be encased in a substantial steel conduit carried as close to the various appliances as is possible.

The wiring diagram in fig. 7 [*ante*, p. 573] may appear complicated at first, and a little explanation may not be out of place. The connection of a series motor to a reversing controller is a comparatively simple matter. It is shown in fig. 11, from which it will be seen that the current passes from the last resistance terminal to the field terminal on the motor, and then through the field windings back to the controller, whence it is sent out through the armature in a direction according to the rotation desired. The reversal of a series wound motor is carried out by reversing the direction of the current through either the field coils or the armature—not, be it noted, by reversing the flow of current in both.



A. Armature. B. Supply Mains. C. Last Resistance Terminal. D. Reverse. E. Forward. F. Field.

Fig. 11.

When a second motor has to be operated from the same controller, it becomes necessary to use a change-over switch, which will disconnect one motor from the controller and make connection with the second machine. Seeing that there are four wires connecting a series motor to a reversing controller, it would appear at the first consideration that a four point or pole double-throw switch was necessary. In practice, however, it is only necessary to break one armature and one field connection, and so a double pole two-way switch is all that is necessary; and this is exactly what the special change-over switch is. It is simply a directional switch, and, having been set to the direction in which it is desired to send the current, ensures that the field and the armature leads from the controller are connected to the armature and the field windings of the particular motor which it is desired to operate. If the wiring diagram be studied in an intelligent manner, and the elementary function of the switch borne in mind, any idea that the wiring is complicated will speedily disappear.

FUSE BOX *versus* CIRCUIT BREAKER.

In stating that a fuse-box alone on an electrical drive, particularly one in which the motor is a series-wound machine, is not a sufficient safeguard the author is guided by practical, and in many ways sad, experience. In previous articles he has dealt at length with this argument, but feels that no apology is necessary for a certain degree of repetition in connection with a point which has so vital a bearing upon the life and running costs of a plant.

The chief characteristic of a series motor is the heavy starting torque which it is capable of exercising, and which renders it an ideal machine for crane work, or, indeed, for any work the nature of which requires a heavy starting effort on the part of the motor. A motor and a dynamo possess dual characteristics, inasmuch as a motor when running generates an electromotive force in its windings which is in opposition to the impressed pressure at the motor terminals, and the greater this opposing pressure is the less current will flow through the motor windings.

The degree of this back electromotive force is regulated by the speed of the motor; so that it becomes apparent that the slower the motor is running the lower will be the pressure which opposes the incoming current, and consequently the heavier will be the current flowing through the motor windings from the external supply. Proceeding, now, to apply this reasoning, we see that, on the occurrence of an overload, which, of course, causes the speed of the motor to drop, an increased current immediately flows through the motor windings, creating, in a motor of the type under consideration, a heavier magnetic field.

Among other factors, the torque which a motor is capable of exerting is proportional to the strength of its magnetic field; and the heavy torque or driving effect which a slowing-up series motor possesses can easily attain such proportions as may result in serious damage, not so much to the motor as to the gearing of the machine to which it is coupled.

Theory teaches us that this is exactly the state of affairs which a fuse-box is designed to prevent; but a moment's consideration will show that a fuse cannot blow instantaneously, in the true sense of the word. It has to reach melting temperature; and in the short time which must elapse between the hanging-up of the motor and the blowing of the fuse almost any damage may result. A fuse is a circuit-breaker with a thermal time limit which will effectually limit the duration of an overload, but which is utterly incapable of preventing the heavy torque which a series motor must exert when something "binds," and which can, and does, cause a smash.

Another valuable argument in favour of the circuit-breaker is the time it saves. Even assuming that a fuse was an instantaneous device, and could be relied upon to open a circuit synchronously with the occurrence of an overload, it must be remembered that a blown fuse will take at least one minute to replace, while a circuit breaker can be reset by one stroke of the operator's hand. The writer's experience shows that the fuse-box should be supplemented by the installation on one pole of the system of an automatic magnetic circuit-breaker of the type used on our street-car undertakings; and this breaker should be tripped daily by hand, so as to ensure that it is in working order. Where electric stoking machinery is installed, this breaker may be of the same size and type as used on that plant, so as to further standardize.

It may be mentioned that in the installation of Fiddes-Aldridge machines under the writer's care the circuit-breakers play a large part in the low maintenance charges of the installation. The failure of a circuit-breaker is invariably followed by the breakage in the gear of one or other of the motions; and the greatest care is taken to keep the breakers in the best possible order. The load on the motors of these machines is a very "dead" one; that on the telpher motors is much more "lively;" while in the case of the latter installation the liability to breakdowns from the cause outlined above is certainly more remote. The installation of a good circuit-breaker, however, may be looked upon in the light of a good investment, and will pay for itself many times over by the protection which it will afford to the mechanical as well as to the electrical equipment of the machine.

A Mysterious Fault.

The following description of a fault which occurred on the plant under the writer's charge, and which is liable to crop up on any plant working under similar conditions, and by its mysterious nature to cause considerable delay, may be of some interest. The telpher plant at the Plymouth and Stonehouse Gas Company's works is situated in the No. 1 retort-house coal-store, and comprises an endless track running the entire circuit of the store. The length of this track is 510 feet; while the radius of the end loops is 18 feet and the height of the track from the ground is 30 feet. A photograph of this track, with the telpher, is shown in fig. 12.

Running centrally above this track for the entire length of the store, and at a height of 35 feet above the ground, or 5 feet above the telpher track, is a large band coal-conveyor, which distributes the coal elevated on to it at one end of the house to any desired place in the store. When large stocks of coal are being stored, portions of the telpher track are completely buried in; and in order to protect the trolley wire from injury an inverted iron trough, as shown in fig. 13, is fitted above the wire for the entire length of the track.

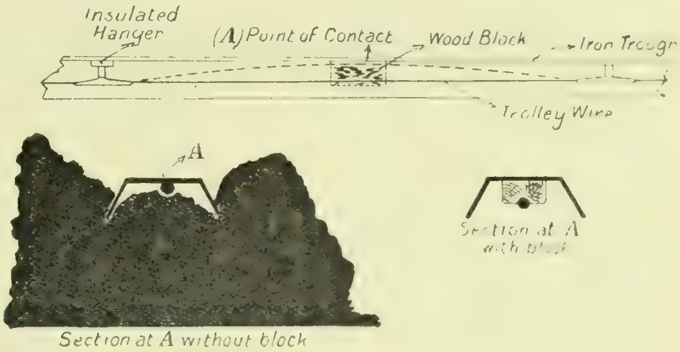


Fig. 13.

About three years ago, a mysterous fault developed on the telpher circuit. The coal-store, being fairly full, the three equidistant elevator boots usually fed by the telpher grab were covered by stocks of coal. Consequently for several days there had been no occasion to use the machine, and the trolley wire circuit had been dropped at the main distribution switchboard

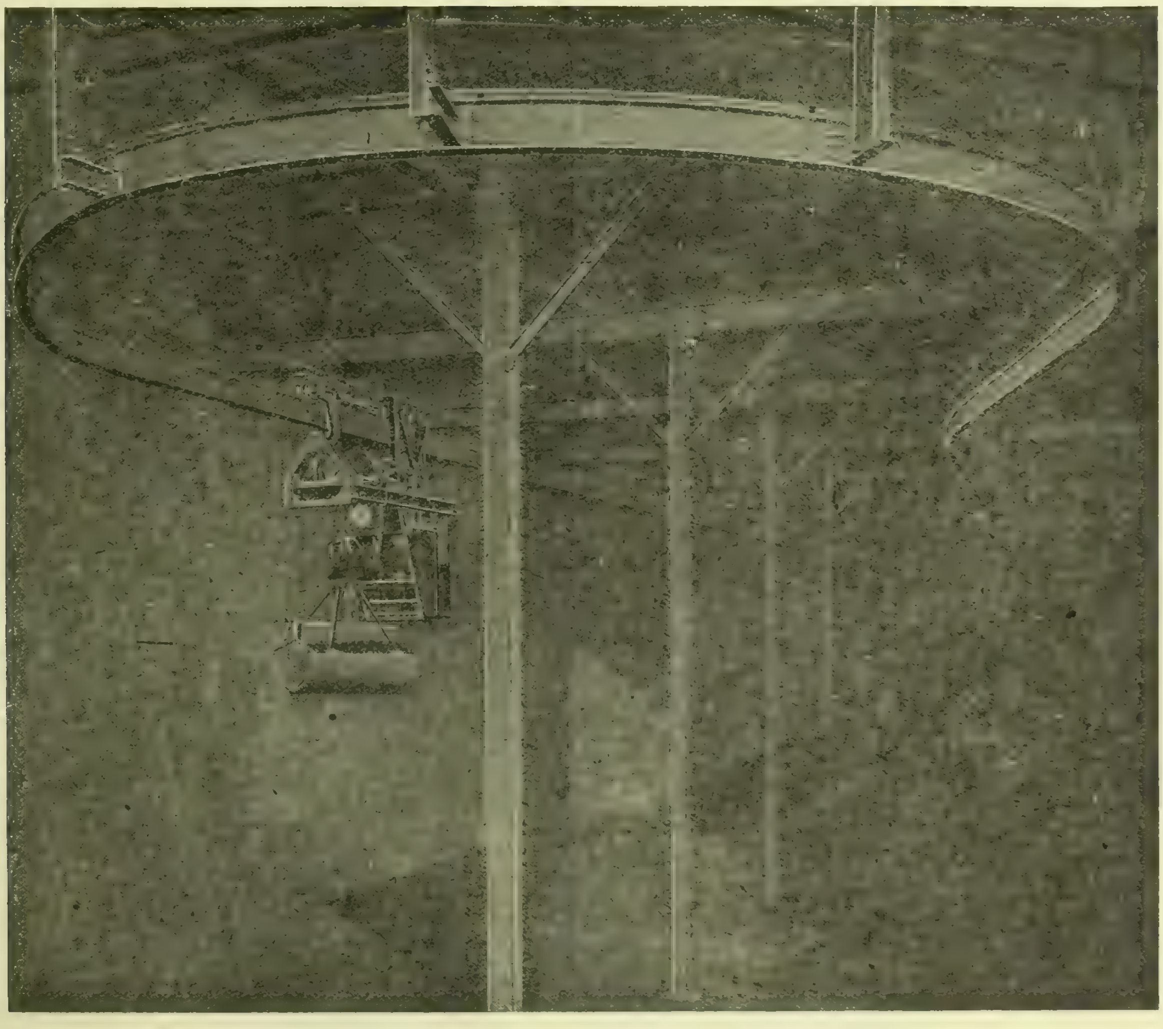


FIG. 12.—TELPHER TRACK AT THE PLYMOUTH GAS-WORKS.

When the telpher was required again, it was found upon switching in, that a bad fault existed on this circuit, and a test with a megger revealed a dead "earth." The removal of the telpher collector from the trolley wire did not clear the fault, which was eventually traced to the trolley line itself; the insulation of the positive feeder from the generating station to the wire being perfectly sound. A large portion of the wire was completely covered up in the manner described, and a gang of men were set to work on top of the coal heap to clear the wire. Three dead "shorts" were discovered at different portions of the buried track; and a study of fig. 13 will make quite clear how the trouble arose.

As the coal had fallen from the hand conveyor it accumulated around, and finally buried-up the telpher trolley wires and, continuing to accumulate around and above the inverted trough, exercised a downward pressure upon that portion of the heap the top of which lay almost against the wires. With the increasing pressure this portion of the heap now began to find its way up into the inverted trough, and touched the trolley wire. All upward movement of the trolley wire was impossible at the points of suspension; but at the points of greatest sag—namely, at the centre of the spans between the suspension ears—the wire, with the coal forcing it, took an upward path until wire and coal were finally arrested by coming into contact with the roof of the iron trough. This fault is not an uncommon one under such conditions, and it is usually the case that the clearing away of the coal does not remove the fault from the line; the trolley wire being nearly always solidly fused to the iron trough just at the point of contact.

The remedy adopted at these works is to insert stout blocks of wood in the manner of distance-pieces at the centre of the spans between the wire and the trough as the heaps of coal are accumulating, and to remove them as soon as the stock grows low and it is desired to run the machine over this portion of the track. The presence of the wood blocks, as would also the presence of the coal in a more or less damp state, doubtless diminishes the insulation resistance of the trolley line; but in the 220-volt direct current installation under the writer's care this factor has never caused any trouble.

The trouble caused by this fault is not limited to the delay in clearing it, but may be further augmented by the fracture of the trolley wire at the point at which it has become burnt in the manner described. The trouble caused by the insertion and the withdrawal of the wood blocks, which are shown in the sketch, is trifling compared with the expense and delay occasioned when several tons of coal have to be removed by manual labour in order to discover a batch of faults.

TRAINING OF OPERATORS.

The training of operators has a very important bearing upon the general efficiency of the plant, and small repair bills on any electrical plant can only be maintained provided the apparatus is in the hands of men who handle it in an intelligent manner. The author does not desire to repeat in this article much of what he has already written on this subject, and would refer all interested readers to an article in the "JOURNAL" for April 14, 1914 (p. 120), on the "Care and Maintenance of the Fiddes-Aldridge Simultaneous Retort Charging-Discharging Machine," in which, under the heading of "The Training of Operators," he devoted some space to this all-important subject.

The bad or careless operator is a thorn in the side of the plant engineer, and is, unfortunately, too often listened to in his tale of woe in regard to his electrical equipment not working properly. Any statement on the part of the plant electrician, to the effect that the operator and not the machine is at fault, is often ridiculed or put down to "spite or incompetence" by the official or foreman to whom the statement is made—usually the last person to whom one would apply for a criticism on things electrical.

In this connection one or two plain facts should be grasped by the engineer who proposes to put down electrical plant. Unless he wishes to have enormous maintenance costs, and to be at the mercy of local electricians, he must engage a good man to look after it for him, and, having engaged him, he must place a reasonable amount of confidence in him and give him a reasonably free hand. No disputes should be permitted between the electrician and the plant attendants. The former either knows his work or he does not. If the latter, he should be fired before he puts the plant on the scrap heap; if the former, his word should be taken and no report on purely electrical matters should be recognized from anyone save the man paid to attend to such matters.

To a certain extent electrical principles have to become, on a gas-works, subservient to local conditions; and a good engineer will recognize this fact and will not attempt to keep the machines under his charge in the same spick and span condition as pertain in a central station. He will simply keep them in a really efficient state, and he should be helped in this endeavour and not hindered. The old axiom "A stitch in time saves nine" is strikingly applicable to electrical machinery; and when it is remembered what a bad breakdown of a large gas-works electrical plant will mean, the gas engineer should need no urging to do his best to keep his electrical plant in a thoroughly efficient condition.

CONCLUSION.

In placing these particulars before the readers of the "JOURNAL," the author rather regrets that his notes on maintenance may not seem to be so comprehensive as, perhaps, would appear desirable. These notes embody largely his experience during the past four years with an installation by Messrs. Strachan and Henshaw, in respect to which the periodical system of inspection advocated has resulted in low maintenance costs, satisfactory running, and entire freedom from breakdown. He holds no brief, needless to say, for the speciality of this particular firm, and has written this article around the mono-rail machine as being, in his opinion, a sound engineering proposition, and one which is certain to give the greatest degree of satisfaction under the severe conditions met with in gas-works plants.

In common with most engineers, his past experience with transporter plants has been a varied, and in many respects an unhappy, one; but in view of the rapid progress of engineering science, and the high degree of perfection to which the plant which forms the subject of this article has been brought in the past few years, it would be unfair to an excellent machine, as well as to prospective users, to give any recital of harrowing experiences with old, inefficient, and to a large degree experimental installations.

In conclusion, the author desires to express his appreciation to Messrs. Strachan and Henshaw for placing at his disposal some of the blocks with which this article is illustrated; and his thanks are also due to Mr. Percy S. Hoyte, the Chief Engineer of the Plymouth and Stonehouse Gaslight and Coke Company, for the courteous permission which has enabled him to place these notes before "JOURNAL" readers.

GAS PRODUCERS FOR COLLIERY WORK.

Obtaining Power and Bye-Products from Unsaleable Fuel.

At last week's meeting of the Institution of Mining Engineers, a paper read by Mr. Mansfeldt H. Mills dealt with the question of whether the introduction of gas producers will reduce the cost of generating power in the getting of coal; while, at the same time (as the author remarked), the use of unsaleable fuel was an all-important matter not to be lost sight of.

Although the advantages of producer gas have been known for many years, he said, still its general use has not been adopted so universally as might have been expected; and it is only during the last few years that any significant advance has been made—doubtless due, in great measure, to the lack of sufficient information on the subject. A good deal has been written in various countries on producer gas and its uses; and as early as 1877 the writer wrote a short paper on the use of waste gas from coke-ovens at Bearpark Colliery, near Durham.

The history of the introduction of the gas producer shows how slowly some useful inventions have been adopted, even when it was clear that the more general use of gas as a motive power would have cleared the atmosphere of our large towns from the offensive smoke which still ruins the health of thousands of our people and disfigures the architecture of our cities.

As early as 1812, a patent was taken out by Mr. Aubertot for the utilization of waste gas for metallurgical operations. It is also said that an Austrian named Bischoff introduced a gas producer about the year 1839, which was internally fired with air-blast, but no steam. About 1849 the makers of the "Otto" gas-engine used a small suction gas producer; and in 1852 Kirkham invented the first gas producer in England, entirely fired from the inside with intermittent air and steam blast. It was not, however, until after 1861 that any considerable use was made of producer gas. About this time the late Sir William Siemens first used a gas producer for steel melting. The water under the fire-bars was vaporized by the heat of the fire—the steam passing up through the incandescent fuel in the producer. In 1876 Messrs. Brook and Wilson took out patents for a producer which formed the basis of future improvements; and in 1878, Mr. J. E. Dowson introduced a producer plant and induced Messrs. Crossley to try it with their gas-engine. But it was not until about 1882 that any real progress was made by them. In 1883 Messrs. Young and Beilby designed a producer with recovery of the sulphate of ammonia; and by 1885 the late Dr. Ludwig Mond had worked out great improvements which undoubtedly led to the more universal use of producer gas—especially from bituminous coals. In 1893 Dr. Ludwig Mond registered important patents which altered the original design of the producer from rectangular to circular; the whole shell being surrounded by a jacket through which the air passed on its way to the grate, thus further superheating the steam and air blast. Arrangements were also made for the recovery of bye-products. Later on Mr. E. J. Duff made some valuable improvements on the Mond process; and eventually the two amalgamated into the Power Gas Corporation.

With the introduction of the pressure-gas producer using bituminous coals, and with the various uses to which the gas came to be put, complicated methods of cooling, scrubbing, and washing the gas became necessary, and much ingenuity was exercised in designing various methods for getting rid of the tar in the gas, and in making the gas suitable for use in large gas-engines. Among those who may be mentioned as foremost in this pioneer work, as well as those already named, are Messrs. Dowson, Kerpely, Crossley, Wilson, and Lymer. And now, in the year 1915, the mining engineer can find a producer plant capable of dealing with almost any class of fuel containing upwards of 50 per cent.

of ash, which, under ordinary conditions of combustion, would cake and form hard clinker—in fact, fuel utterly valueless for any other purpose can now be gasified successfully.

Before giving the actual working results of various types of gas-producers, the writer made a few general remarks on the principles that govern their proper working, which he hoped might be useful to those who, so far, had not given much attention to the subject. He dealt specially with three different systems of generating producer gas—viz., the suction gas producer, the pressure gas producer, and the pressure gas producer with recovery of bye-products.

Suction Gas Producer.—In this plant anthracite, coke, and non-bituminous coals are generally used, although some suction gas producers are working on bituminous coal. The gas generated is used in a gas-engine, which is in direct connection with the producer without any intervening gasholder. Whether a four-cycle or a two-cycle gas-engine is used, the sucking action is the same. In the four-cycle engine the suction stroke of the piston in the cylinder opens the gas-inlet valve in the gas-main and draws in the required charge of gas, and, at the same time, draws into the producer a sufficient quantity of air for the combustion of the fuel. In the two-cycle engine an independent pump draws in the gas from the producer, discharges it into the working cylinder of the engine, and, at the same time, draws in the necessary air to the producer. Thus, it will be seen that in both cases the air supply to the producer depends upon the number of strokes of the engine; and in this way the combustion of the fuel is regulated to the requirements of the engine. This is the most simple form of gas producer, and where anthracite, coke breeze, or coke are abundant, and can be obtained at a low price, very economical power is generated.

Pressure Gas Producer.—At many collieries in this country it is necessary to use bituminous or semi-bituminous coal; and it has been found that the large amount of tar in the gas made from this class of coal clogged-up the valves of the gas-engines to such an extent that washers and scrubbers had to be interpolated between the producer and the gas-engine. This, in many cases, prevented the suction stroke of the gas-engine from being used for drawing in the necessary air to the producer for the combustion of the fuel; so that a fan is brought into action to force or draw the air through the charge of fuel. Hence the name "pressure" gas producer.

Pressure Gas Producer, with Recovery of Bye-Products.—All coal, he said, has a certain percentage of nitrogen in its composition, varying according to the class of coal. For the sake of illustration, a coal with 1·377 per cent. of nitrogen would theoretically give 147 lbs. of ammonium sulphate per ton of coal gasified. In practice, upwards of 80 lbs. of ammonium sulphate would be recovered from each ton of such coal passing through the producer, which may be valued at 9s. when sulphate of ammonia is selling at £12 a ton. This valuable bye-product has induced designers of producer plants to bring out various systems for its recovery—endeavouring at the same time to keep the gas up to a high grade for the use for which it may be required.

It must be understood that the principles entailed in generating producer-gas are the same, no matter which type of producer is used; and the author, in this connection, quoted from Wyer's "Treatise on Producer Gas and Gas Producers," where he says:

> For the proper understanding of the action of a gas producer, it is well to divide the charge of fuel in the producer into four zones.
>
> *Ash Zone:* The primary object of the ash zone is to keep the intense heat of the combustion of the fuel away from the grate and thus prevent "burning out." It also heats the air and steam before going to the combustion zone.
>
> *Combustion Zone:* In this zone the air and steam meet the carbon; the oxygen uniting with the incandescent C to form CO_2; while the steam is superheated and possibly begins to decompose.
>
> *Decomposition Zone:* This is where CO is generated, the steam decomposed into H, and the CO_2 reduced to CO. A large amount of heat will be absorbed in this zone to compensate for the carbonization of CO_2 and the decomposition of the steam. In order that the reactions may take place, the temperature must be kept above 1800° Fahr.
>
> *Distillation Zone:* This occupies the upper part of the fire. The addition of fresh fuel always reduces the temperature; but the heat from the lower zone distils the volatile constituents of the fresh fuel.

The nature of the hydrocarbons will depend upon the temperature. If the temperature in each zone is kept at the proper level, the hydrocarbons will be easily broken up and the hydrogen liberated.

It has to be remembered that it is one thing to design a producer plant and carry out carefully-considered tests under the supervision of highly-trained men, and quite another to carry on the daily work of the producer with varying qualities of fuel and the difficulty of determining the ratio of steam and air blast with the trouble of keeping up an even burning within the producer and all the many little causes that militate against the delivery of a constant supply of high-grade gas. The writer thinks that the description he proceeds to give of the working results of several different types of gas producers will show how all these difficulties are now overcome, and how a large proportion of the power required at a colliery can be generated, using a fair proportion of unsaleable fuel, and how bye-products can be recovered, in many places, sufficient to repay the whole cost of the fuel; and beyond this there is the inestimable advantage of carrying on large industries without polluting the surrounding country with volumes of dense smoke.

The descriptions of the results of working various types of producers are given in the following order:

(1) The Mond gas producers at Langwith, Nottinghamshire, and at Denaby Main and Brodsworth Collieries, Yorkshire.

(2) The Kerpely gas producer plants at the Shelton Iron, Steel, and Coal Company's works, Shelton, and at Messrs. Lumb and Company's glass works, Castleford.

(3) The Wilson gas producer plant at the Littleton Collieries, Stafford.

(4) The Dowson and Mason gas producer plant at Messrs. Smith and Faire's works, Leicester.

(5) The Kynoch "Cambridge" bituminous suction-gas producers, and the same Company's suction-gas plant for non-bituminous coals.

(6) The "Duff" gas producer, designed and erected by the Gas Power and Bye-Products Company, of Glasgow.

A lengthy illustrated description of these six different plants is given; and then the author summarizes his paper by saying: These descriptions do not by any means exhaust the number of gas producers now at work in this country. The nature of the fuel that it is desired to gasify is so varied that in almost every case some slight modifications are necessary. Consequently, it is essential to consider fully the varying circumstances of each case with one of the designers of such plant as may seem most likely to be able to deal successfully with the particular fuel that is to undergo gasification. From the information which he has collected, it may, he says, be gathered that, although low-grade fuels are not being generally used in gas producer plants, the results attained at the Shelton Company's and other plants show that a low-grade fuel is capable of being gasified, and that the resulting gas can be sufficiently purified for heating and power purposes.

At many collieries large quantities of "batty" coal are thrown back into the goaf; and in many cases where the coal at the top or the bottom of the seam is inferior, it is left in the mine—in fact, our coal-seams are being worked in a wasteful manner, as if there were no end to the store of our mineral wealth. It will, no doubt, be said that coalowners are not going to reduce the output of good saleable coal by sending out rubbish; and that the present-day strenuous wish to increase the output will not allow of rubbish being got and sent out of the mine. It has, however, to be remembered that every ton of unsaleable coal gasified saves at least half-a-ton of good coal.

The country cannot expect the coalowner to increase the cost of getting the merchantable fuel in order to use up the low-grade fuel now lost; but the country has a right to ask that our rapidly-diminishing supply of fuel shall not be wasted, and that our mining engineers, our chemists, and our mechanical engineers shall work together for the prevention of this waste.

In many parts of England there are seams of coal that are unsaleable at a profit at the present time, merely because they are unsuited to present-day requirements; but the gas producer and the gas-engine are now making this class of fuel available for generating power at a wonderfully low cost.

The art of utilizing low-grade fuel must be cultivated if we are to retain our great place in the world for generations to come. The designers of gas producer plants are actively engaged in meeting the many difficulties connected with the use of low-grade fuels. But the mining engineers who advise our large colliery companies are slow to advocate the erection of plant that may prove unsuitable for their special purposes; and so the advancement of science is checked.

Wales and Monmouthshire District Institution.—There will be a meeting of the Wales and Monmouthshire District Institution of Gas Engineers and Managers at Caerphilly on Wednesday of next week, when the President (Mr. A. W. Branson, now of West Hartlepool) will deliver his address, which will be open to discussion. This will be followed by the presentation of the report and statement of accounts of the Special Purposes Section, an informal discussion on the "C" process [for which purpose Mr. John Bond, of Southport, will attend and address the members], and a paper by Mr. A. G. Leighton, on "Home Sales of Sulphate of Ammonia." Luncheon on the invitation of the Rhymney and Aber Valleys Gas and Water Company will precede an inspection of the gas-works and Caerphilly Castle.

Westminster Technical Institute Courses.—A copy of the prospectus of evening courses of instruction at the London County Council Westminster Technical Institute, Vincent Square, S.W., for the forthcoming session has been forwarded by the Principal (Mr. J. Stuart Ker, B.Sc.), who points out that, in view of the efforts now being made to open up new fields of industry, the necessity for the expansion of the work of technical education is more than ever necessary. The different classes begin this week; and they include gas engineering and manufacture, gas-fitting, gas supply, technical calculations and drawing, heating and ventilating engineering, and civil engineering. The courses in which readers are particularly interested are now so well known, and have been so successful, under the different teachers whose names appear in the prospectus, that it may suffice here to call attention to the opening of the new session. New students will, however, find a full indication of the scope of the different classes in the "JOURNAL" for Sept. 22 last [p. 674].

MITIGATION OF ELECTROLYSIS.

One of the recent "Notes" of the United States Bureau of Standards contained an abstract of a Technology Paper on the above-named subject. It discussed generally the question of electrolysis, and compared the conditions in America with those existing in other countries. Electrolytic corrosion proper, as distinguished from self-corrosion, was dealt with, and electrolytic effects in concrete and steel buildings were briefly touched upon. The effects of stray currents other than corrosion—for example, the production of fires or explosions—were also discussed. The abstract of the paper is as follows.

All the various methods of electrolysis mitigation which have been proposed or tried are discussed under two main heads: First, those applicable to underground pipe and cable systems; and, secondly, those applicable to the railway negative return. The methods applicable to underground pipe systems comprise the following: (1) Surface insulation of the pipes: (2) chemical protection—that is, rendering the pipe surface passive by surrounding it with earth filled with lime or other chemical that will prevent corrosion; (3) cement coatings; (4) cathodic protection—that is, maintaining the pipe or cable always negative to earth by means of a motor generator set or battery or other sources of electromotive force; (5) favourable location of pipe with respect to tracks; (6) the use of non-corrodible conducting coatings; (7) electric screens; (8) the use of insulating joints in pipes; (9) pipe drainage.

The discussion leads to the conclusion that, of the various methods under this class that have been tried, none are suitable for general use as primary means of preventing electrolysis trouble; and the methods of chemical protection, cement coatings, cathodic protection, and conducting coatings should be regarded as substantially worthless in the present state of development. Surface insulation of pipes by means of paints or dips is not much more reliable; but insulation by putting pipes in troughs or conduits filled with pitch may be used in special cases where the expense would be justified. The practice of placing all pipes as far as possible from railway tracks affords a certain measure of protection, of which advantage should always be taken wherever practicable in laying new lines or relaying old ones. The use of electric screens is often a valuable expedient in taking care of acute local cases of trouble in existing mains. These methods, with the exception of that relating to the proper location of pipes in new work, are suitable only to special conditions, however, and are not usually to be considered as important factors in any general plan for the mitigation of electrolysis.

Pipe drainage is sometimes useful; but it should be used with proper restriction, and with due precautions against setting-up dangerous conditions either in the system drained or in neighbouring systems. In general, in city networks where there are a number of independent underground systems to be protected, pipe drainage should be used as little as possible; the chief reliance being placed on mitigative measures applied to the railway negative return. The drainage of lead cable systems will, however, usually be desirable, and these should always be drained by means of suitable insulated feeder systems so arranged as to drain the least practicable current from the cables in order that neighbouring structures may not be subjected to unnecessary danger thereby.

The most valuable mitigative measure that can be applied to the pipe system consists in the proper use of insulating joints, and the extensive employment of such joints should be encouraged in new work in making repairs. Precautions are necessary in their use, however; and these are set forth in the discussion.

Taking up the methods applicable to the railway system, there is a very brief reference to the alternating-current system, double-trolley system, the use of negative trolley, and the periodic reversal of trolley polarity. This is followed by a somewhat extended discussion regarding methods of reducing potential differences in the uninsulated portion of the negative return. The discussion leads to the conclusion that the alternating-current system, the double-trolley system, the use of negative trolley, the periodic reversal of trolley polarity, and the use of uninsulated negative feeders in parallel with the rails, when considered solely as methods of electrolysis mitigation, are either impracticable or else open to the objection that the expense or operating difficulties attending their application are rendered unnecessary because of the fact that there are other adequate methods available for general application which are comparatively cheap to install and which introduce but slight complications into the operating system.

The importance of proper construction and maintenance of track return is emphasized, and the drainage of the roadbed where practicable is urged. Also where the track is laid on private right-of-way the rails and ties should be kept as far as possible out of direct contact with the earth by the use of good rock ballast. It is also pointed out that the three-wire system, when viewed solely from the standpoint of electrolysis mitigation, possesses large possibilities. Attention is called to the fact, however, that up to the present sufficient experience has not been had with this system to determine whether it is practical from the operating standpoint under average conditions of service. It is therefore urged that experiments with this system should be made under conditions to which it is best adapted.

The most effective methods that have been thoroughly tried in practice over long periods are the use of insulated negative feeders either with or without boosters, generally the latter. In most cases where the feeding distances are not too long, an insulated feeder system without boosters will prove cheapest and at the same time more satisfactory because of its greater simplicity. It is possible, by the proper application of such systems, to reduce the potential gradients in the earth to such low values that in most cases little damage would result. In many instances, however, it may be better, where conditions are favourable, to combine one of these methods, with either the insertion of a moderate number of insulating joints in the pipes or with the use of a very limited amount of pipe drainage, provided local conditions favour the use of this method. The insulated feeder system would be applied to reduce the potential gradients throughout the system to very low values, and one or other of the auxiliary systems used to eliminate largely any residual electrolysis that might remain.

The last section of the paper is devoted to a discussion of regulations regarding electrolysis mitigation. The subject of what criteria should be used for determining the adequacy of electrolysis conditions is taken up at some length, and it is shown that potential measurements having a total drop of potential in the railway negative return and also potential gradient measurements throughout the track network are very valuable. It is also shown that all-day average values of these potential readings give a better criterion of the actual danger from electrolysis than any short-time peak value. It is recommended that in fixing voltage limitations some plan analogous to the zone system should be adopted; the voltage limits prescribed for the various zones being determined largely by the degree of development of the underground utilities in the various zones. The voltage drops either in the tracks or in the pipes, and earth may be used as the basis for fixing limitations; but in general the latter is to be preferred. The question of what constitutes a safe limit for voltage drops in the track return is discussed at some length, and the conclusion is reached that for the overall potential drop in the railway tracks a limit of from two to four volts is reasonable and adequate, and the potential gradient should in general be restricted to 0·3 or 0·4 per 1000 feet—these figures being all-day average values. Where short-time peak values are used, the figures would, of course, be considerably higher.

In order that ready determination of voltage drops may be made at any time, potential wires should be installed, running from some central point to selected points on the railway or pipe networks. These points should include the points of approximately highest and lowest potential, and preferably also intermediate points. It is recommended that exemption from any regulations regarding track voltages should be made in special cases (as described in the paper) where local conditions make it improbable that any serious damage would result.

The responsibilities of the owners of underground utilities regarding the mitigation of electrolysis troubles is discussed, and it is recommended that any regulations governing electrolysis mitigation should be made to apply not alone to the railway system, but should also define the responsibilities of the owners of underground utilities, since the latter can often contribute materially to the diminution of the trouble at a cost that is, practically speaking, negligible.

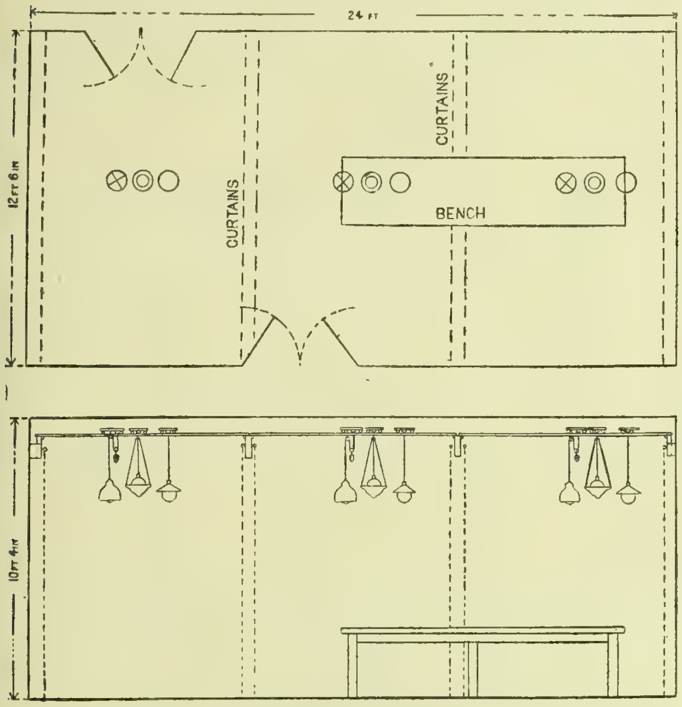
New Benzol and Toluol Works in America.—In an article entitled "The Manufacture of Coke Bye-Products in the United States," when referring to the supply of benzol and toluol in America, "Engineering" recently said: Benzol and toluol were not manufactured at all in America before the war. Consumers were supplied at cheap prices from Germany, where the manufacture of these auxiliary products is most advanced, so that there was little occasion for America to take up this manufacture; but now that importation from Germany has ceased, America has been compelled to erect works for the production of benzol. In the districts of the large steel-works, special efforts are being made to remain independent of imports after the war; and benzol works are being built. Difficulty has, in the meantime, been experienced in the completion of the works. A Westphalian firm which makes a speciality of erecting benzol works, and which had been entrusted with a large order for the Lackawanna Steel Company, has, from patriotic reasons, declined to complete the installation as long as the war lasts. The Lehigh Coke Company had also commissioned the same German firm to build a benzol-works with a capacity of 1300 gallons per day, at a cost of $350,000. For these works only the foundations have been laid; and they will, in any case, not be finished before the end of the war. So the Company is debarred from deriving any benefit from the present market position of benzol in the States. The Carnegie Steel Company, which also had entered upon an agreement with the Westphalian firm for the erection of benzol works—the completion of which, however, has been postponed for the same reasons—have annulled their agreement, and are now attempting to finish the factory themselves. It is, however, very questionable whether they will succeed in doing this without delay, as the construction of such works is connected with some important patents, which are controlled by the Westphalian firm. The price of benzol in the United States has risen from 20 c. to $1 per gallon since the war broke out.

WORKERS AND LIGHTING EXPERIMENTS AT THE NATIONAL PHYSICAL LABORATORY.

In the recently issued report of the Departmental Committee on Workshop and Factory Lighting, a very interesting account was included [in Appendix XIV.] of the experimental room at the National Physical Laboratory at Teddington, in which a considerable number of the tests made by direction of the members were carried out. It was equipped with different methods of lighting, and so arranged that the illumination by each method could be readily varied in degree. Various phenomena brought to the notice of the Committee by witnesses were examined in this room; workpeople were tested to ascertain the illumination required for their work; and the members of the Committee made experiments under conditions of illumination similar to those existing in the various factories which were inspected by them.

Description of Room.

The room was rectangular in plan, 24 feet long by 12 ft. 6 in. wide; the height from floor to ceiling being 10 ft. 4 in. The whole of the wall surface, as well as the ceiling, was whitened, in order to reproduce the conditions obtaining in a small factory room. At the same time black curtains were provided, which could be drawn across the white walls—thus approximating to the conditions in the centre of a large factory room, where the effect of the light reflected from white walls is negligible.



Plan and Elevation of the Experimental Room at the National Physical Laboratory.

In addition to this, the room could be partitioned into three compartments by means of white or black curtains—each compartment being illuminated with its own lamps. In this way, an observer could pass quickly from one set of previously arranged lighting conditions to another. Comparisons under these conditions were thus made possible without the necessity of any intermediate adjustment.

The following three systems of illumination were installed:

(1) Direct lighting by unobscured metal filament lamps with ordinary opal glass shades. The height of the centre of these lamps above the floor was 7 ft. 6 in.

(2) Indirect lighting by metal filament lamps with inverted white reflectors, which intercepted all downward light and reflected it upwards upon the ceiling, whence it was diffused over the room. The height of these lamps was the same as those of system (1).

(3) Shielded lighting, in which similar lamps to those used in system (1) were enclosed in aluminium shades of approximately parabolic form. These shades shielded the eyes from the direct light of the lamp, throwing it in a downward direction upon the table beneath. The height of these lamps could be varied at will.

By means of resistances placed in circuit with the lamps, any degree of illumination up to the maximum of (approximately) 12-foot candles—underneath the lamps—could be readily obtained. To obviate the difficulty arising from the difference in colour of the light when the lamps were running at very low voltages, it was possible to replace the ordinarily used lamps by others of smaller candle power.

Electric light was used in the equipment of this room on account of the greater ease of regulation for experimental laboratory purposes. So long as a suitable and conveniently adjustable means of lighting was available, it was not of consequence for the purpose of the experiments whether it was from gas or electric lamps.

In the case of the indirect lighting, the illumination did not vary seriously over the area below the lamps; but with the direct lighting, the illumination midway between the lamps was 70 per cent. of that immediately underneath them.

The uniformity of illumination from the shielded lights was more dependent than in the case of the others on their height above the table; but this system was used mainly for the examination of the effects of local lighting.

It was found that the reduction in the illumination at the centre of the room, due to the blackening of the walls, was approximately 25 per cent. in the case of direct lighting, 7 per cent. for indirect lighting, and negligible for the shielded lights.

Experiments with Workpeople.

The workpeople mainly examined were seamstresses from the workrooms of some of the principal London outfitting firms. They were examined two at a time—each examination lasting for about a day. In addition to these, two tailors from the East End of London have been examined; but the results obtained require supplementing and confirming before they can be considered reliable. In the case, however, of the seamstresses, three entirely independent examinations were made; and the measure of agreement which the results afford indicates that they may be accepted as of fairly general application for the type of work upon which they were engaged.

The workpeople were asked to work on various materials, mostly without any pattern, with cotton of the same colour as the material. Chief attention was paid to white and black cloths, as representing the two extremes. For work on any given material, the illumination to start with was put at a value which the workers stated was too low for the work in question. It was then raised by a definite amount, and the two workers under examination were left to sew for fifteen or twenty minutes, after which they were asked whether in their opinion the illumination was sufficient for the work they were doing. If it was not sufficient, a further increase was made; and they were left to work for a further period. In this way, an illumination was reached which the workers considered sufficient for the work in question. With the lighter materials, this point was in all cases quite definite; but when working with black cloth, although the workers stated that (for instance) 4 foot-candles was sufficient by which to see their work, they all considered that it was not really a high enough illumination for comfort. The illumination for comfortable working with black cloth proved on the average to be about 5½ foot-candles. Similar tests were made with each pair of workers; and the following table gives the decisions arrived at by each one of them, together with data as to the coefficient of reflection of the materials worked upon:

Illumination required by Seamstresses for Working on Different Self-Coloured Materials with Threads to Match the Material.

Material.	Coefficient of Reflection.	Worker.	Minimum Satisfactory Direct Illumination for Continuous Work.	Illumination which was Comfortable to Work with and which may be Considered as Ample.
	Per Cent.	Miss.	Foot-Candles.	Foot-Candles.
White calico.	97	S.	1¼	
		W.	1¼	
		O.	1¼	
		F.	1¼	
		B.	1¼	
		L.	1¼	
Holland colour.	52	S.	1¼	
		W.	1¼	
		O.	1½	
		F.	1½	
		B.	1¼	
		L.	1½	
Slate colour.	12	S.	2	
		W.	2	
		O.	1¾	
		F.	1½	
		B.	1½	
		L.	1½	
Purple, with strongly-marked sheen.	8	S.	2	
		W.	2	
		O.	2¼	
		F.	2	
		B.	2	
		L.	2	
Black.	2·4	S.	4	5½
		W.	4	5½
		O.	4	5
		F.	4	5
		B.	4	5 6
		L.	4	5 5
Black velvet.	—	S.	4	
		W.	4	
		O.		5
		F.		5
Embroidery.	11	B.	2	3
		L.	2	3

All the results given were obtained with "direct light"—that is to say, the light was received directly from a lamp placed above the worker in such a way as to be free from glare. Many tests were also made with the object of ascertaining the relative ease with which sewing work could be carried out with "direct" and "indirect" light respectively. When, for any given material worked upon, the value of "direct" illumination had been decided on which was regarded by the workers as adequate, the lighting was quickly switched-over to the "indirect" type of equal intensity. The decided opinion of the workers in every case was that the "indirect" illumination, even though it might be equal in intensity to the "direct" illumination, was inadequate, and required to be very appreciably increased for sewing work. The increase asked for was in one case 100 per cent., and in others about 40 per cent. The reason for this was investigated separately, and is dealt with later.

The sight of each seamstress was examined for errors requiring correction with glasses. Several of the workers proved to have imperfect sight, but did not appear to show any desire for a higher illumination by which to work than those with normal sight. Trials were also made with blackened, instead of whitened, walls; but, provided the illumination on the work was arranged to be the same in both cases, the workers did not find that their ability to carry on work was affected.

[There is introduced at this point a report by Mr. J. Herbert Parsons, M.B., D.Sc., F.R.C.S., on the eyesight of the six seamstresses whose work was being tested.]

OBSERVATIONS BY THE COMMITTEE IN THE EXPERIMENTAL ROOM.

Degrees of Illumination.—The illumination in the room was adjusted to different values from 0·1 foot-candle to 10 foot-candles; and at each illumination the members of the Committee tested their ability to distinguish detail by means of cards with figures printed on them in ordinary type, varying from a height of 1·2 mm. to 2·8 mm. The cards were of different colours, from white to dark blue; so that the contrast between the black figures and coloured cards varied appreciably. The observations were made with (*a*) thoroughly diffused light (indirect), (*b*) direct light from exposed sources, (*c*) direct light from well-shaded sources. It was found that while it was possible to read the smallest type on the white cards at an illumination of about 0·75 foot-candle, the small figures on the dark blue cards could not be seen with an illumination of 6 foot-candles. The type of illumination, whether direct or indirect, made no difference to the ability to see, so long as there was no direct reflection from the surface of the cards. An illumination of from 3 to 4 foot-candles gave the impression from general observation of a well-lighted room; while it appeared that from 0·1 to 0·25 foot-candle would be the order of illumination which would suffice for corridors.

White and Black Walls.—The effect was studied of illumination by direct and indirect light both with and without the presence of white walls. The increased restfulness of the diffused (indirect) light was noted, and also the annoyance through the glare of bare lights, particularly when these were seen against a dark background.

Perception of Detail by Direct and Indirect Light.—The ability to discern the details in fabrics was tested both by direct and indirect light; and it was found that the absence of shadow which resulted from using indirect light seriously impaired the ability to see in detail the separate threads in a self-coloured cloth.

Diversity Factor.—A long workbench was illuminated by direct light from three sources, and in such a way that the illumination at the ends was one-seventh of that in the centre. To ordinary observation, unaided by measurements, the actual difference of illumination appeared to be much less than this.

Glare.—A test-card, having figures printed on it, was fixed at eye-height, and an observer adjusted his distance from it so that he could just read the lines of figures. The time taken by him to read the lines of figures was noted, after which a 100-candle power lamp was placed in front of him, so that the vertical distance between the lamp and test-card subtended an angle of about 20° at his eye. The time required to read through the figures under these conditions of glare was again noted. Precautions were taken to ensure that the illumination on the card was the same in the two series of readings. At illuminations from 2 to 4 foot-candles, there was no diminution of ability to read the figures; but with an illumination of 0·5 foot-candle, the exposed source of light rendered it practically impossible to distinguish them.

Ability to See Detail in Different Materials of the Same Surface Brightness.—Blue fabrics of identical texture but varying from very light to very dark blue* were examined under conditions of illumination such that the surface brightness of all the fabrics was the same. That is to say:

Coefficient of reflection × illumination = constant.

In the opinion of the Committee when the above relation held, the ability to distinguish detail in all the fabrics was the same. The matter, however, required further investigation.

This question was subsequently further investigated by Mr. W. C. D. Whetham, F.R.S., a member of the Committee, who reports as follows:

It is a matter of common knowledge, confirmed conclusively by evidence given to the Committee by operatives, that more light is required in factories where the colour of the material worked upon is dark than where it is light. This fact would make all attempts to define "adequate illumination" almost hopeless unless some new criterion can be discovered.

Dark coloured substances look dark because they reflect much less light to the eye than light coloured substances; and it seemed possible that the power of distinguishing detail, on which comfort and quality depend, would be related to the actual amount of light which entered the eye—that is, to the surface brightness of the material—rather than to the amount of light falling on the work—that is, the illumination.

To examine this question, an investigation was carried out at the National Physical Laboratory with the skilful help of Mr. Bernard P. Dudding; the arrangements being previously made under the superintendence of Mr. C. C. Paterson. The work was carried out in a dark room, in which the illumination given by electric light was under control.

In the first series of experiments, four samples of calico were used. They were dyed different tints of blue, ranging from very light to very dark, almost black. The illumination was slowly raised by an assistant till the observer, who was ignorant of the illumination reached, was able to distinguish the threads of the warp and weft of the calico. The illumination was then kept steady, and measurements taken of the illumination and of the surface brightness of the material relative to the surface brightness of the white card of the lumeter. The following results were obtained:

OBSERVER "W.C.D.W."

Illumination Needed to Make the Threads Visible.	Corresponding Surface Brightness.
(I.) *Very Light Blue Calico.*	
Foot-candles.	
1·4	0·7
1·65	0·9
1·4	0·7
(II.) *Light Blue Calico.*	
2·0	0·75
1·7	0·70
(III.) *Full Blue Calico.*	
4·8	0·63
5·8	0·86
(IV.) *Dark Blue Calico.*	
12·0	0·62
12·5	0·68

OBSERVER "B.P.D."

Illumination Needed to Make the Threads Visible.	Corresponding Surface Brightness.
(I.) *Very Light Blue Calico.*	
1·0	0·64
0·8	0·52
(II.) *Light Blue Calico.*	
1·9	0·72
1·3	0·50
(III.) *Full Blue Calico.*	
4·0	0·52
3·6	0·48
(IV.) *Dark Blue Calico.*	
10·5	0·60
14·0	0·85

Hence it appears:

(1) That the illumination needed to make work possible on a very dark material may be ten times that required with a very light material.

(2) That, on the other hand, the requisite surface brightness is constant within the limits of experimental error.

(3) That the average surface brightness needed to make the threads of calico of different tints visible to one normal eye ("W.C.D.W.") may be represented by 0·73, and to another normal eye ("B.P.D.") by 0·60.

Another series of experiments were made with coloured cards on which rows of figures were printed. Here the visibility depends on the contrast of colour between the coloured card and the black ink. The problem is, therefore, different from that of the adequate illumination of calico where the visibility depends on the shadow cast by the threads.

OBSERVER "W.C.D.W."

Illumination Needed to Make Print Legible.		Corresponding Surface Brightness.
0·144	white card	0·13
0·125	pink card	0·11
0·50	light-blue card	0·19
0·80	dark-blue card	0·20

OBSERVER "B.P.D."

Illumination Needed to Make Print Legible.		Corresponding Surface Brightness.
0·04	white card	0·044
0·05	pink card	0·044
0·104	light-blue card	0·048
0·20	dark-blue card	0·052

In this case, while the illumination needed to make print legible on a dark-blue card is some five times that required with a white card, the surface brightness is nearly constant, though there are some indications that it tends slightly to increase with the darker colours. This is natural, as with a black card black print would be presumably invisible at all illuminations. But, except in this extreme case, there seems reason to believe from experiments that, for a given kind of work, it may be found that the necessary surface brightness is independent of the colour of the material.

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* The approximate coefficients of diffused reflection of the three principal fabrics examined (expressed as a percentage of incident light which was diffusely reflected), were as follows:

Dark blue	6 per cent.
Medium blue	14 per cent.
Light blue	40 per cent.

Perception of Detail by Direct and Indirect Light.

The degree of illumination required for the purpose of distinguishing detail under different systems of illumination was the subject of further experiment. The investigations described above were repeated by other observers, and the conclusions before arrived at were confirmed—viz., that the threads of different coloured materials could be just distinguished when the illumination was raised to such a value that the surface brightness of the different materials was the same. In order further to amplify these experiments under more rigid conditions, an investigation was carried out at the National Physical Laboratory by Mr. J. W. T. Walsh, using embossed matt-papers of different shades of grey, but all non-selective in their diffusion properties. Ten different specimens of toned paper were used, varying in shade from very dark to very light grey. They were embossed from a copper plate having an arbitrary design which included lines of many different depths—the embossing being carefully performed in a hand-press, so that the mattness of the surface of the papers was as far as possible unaffected. The papers were then illuminated from a single and relatively small source of light, and viewed from a fixed distance and in a definite direction.

It will be observed that the visibility of the embossed pattern depends: (1) On the variation of the surface brightness over the raised portions of the pattern, due to changes in the angle which such surfaces make with the direction from which the light comes; (2) on the shadows cast on the background by the raised portions of the pattern. Both of these effects depend upon whether the light comes from one single direction, or from a number of widely different directions.

The illumination was gradually raised until one particular part of the embossed design (which was of medium fineness) could be just discerned, while another finer portion could not. In this way it was found possible to obtain results which were reproducible to a considerable degree of accuracy.

The results obtained are given in the following table:

Paper No.	Approximate Coefficient of Reflection.	Surface Brightness at Point of Visibility of Design.
	Per Cent.	Foot-Candles.
1	80	0·031
2	60	0·029
3	37	0·030
4	23	0·027
5	21	0·031
6	17	0·033
7	16	0·028
9	11	0·027
10	9½	0·032
11	3½	0·027

The figures in the last column show the remarkable constancy of the surface brightness required for the perception of detail by direct light, where such perception mainly depends on the contrast between the brightness of the ground surface and that of the shadows cast by the embossed detail or on the variation of brightness over the surface of such detail.

In the case of indirect lighting no such definite conclusions could be arrived at; but it was readily apparent that for equal ease in distinguishing detail, a considerably greater illumination was required than in the case of direct light. This is only to be expected, having regard to the fact that the shadows shown by indirect light are always far less intense than those given by direct light, and that the variation of illumination over a curved surface is also much less with diffused light. The superiority of direct light for sewing was insisted on by the seamstresses who worked in the experimental room under different illumination conditions.

Some of the main conclusions arrived at as the results of experiments made at the National Physical Laboratory may be summarized as follows:

(1) The illumination required for the perception of detail in materials having a low coefficient of reflection is greater than for those which reflect more strongly, and, other things being equal, is inversely proportional to such coefficients of reflection—that is to say, for equal visibility there must be constant surface brightness.

(2) The visibility of detail in self-toned portions of fabrics, embossed paper, and similar substances depends on the unidirectional character of the light illuminating them. It follows, and has been shown experimentally, that the ability to distinguish detail in such substances is for the same illumination much greater by direct than by indirect light.

(3) Work such as sewing may be comfortably performed on the darkest materials with an illumination of 5 to 6 foot-candles (direct lighting); for white calico, 1¼ foot-candles was found sufficient; and intermediate shades were found to lie between these values.

(4) The observations on the phenomena of glare have not as yet yielded definite numerical results. They have shown, however, that the presence of a bright lateral light, although causing a feeling of annoyance, does not actually diminish ability to distinguish detail unless the surface brightness of the object viewed is relatively low.

CARBONATE OF POTASH FOR PURIFYING GAS.

A new system for the extraction of sulphur and cyanogen from coal gas by means of a solution of carbonate of potash was the subject of an article by Heer Th. Petit in a recent number of "Het Gas." The following is an abstract translation of it.

The dry purification of gas is becoming troublesome to gas managers, and they have consequently exercised their skill in trying to supersede it. The result has been the taking out of numerous patents for the extraction of cyanogen and sulphuretted hydrogen by the wet method. The Feld and Burkheiser processes have been frequently referred to; but, though there has been a large expenditure of money, the results achieved have not been such as to allow of the introduction of the processes into gas-works generally. Should sulphur purification by the wet method ever find its way into gas-works practice, the chemical control of the system ought to be as easy as that of an ammonia washer. Heer Petit has patented a new process, the entire plant for which consists of two rotary washers, one of which serves for revivifying the liquid which has been saturated with sulphuretted hydrogen in the other. This liquid consists of a solution of carbonates and hydro- or bi- carbonates of the alkaline earths and alkalis. Preference is given to a solution of carbonate of potash (K_2CO_3), for the reason that, during the whole course of the process, no sediment is produced, and the liquid remains as clear as water. In the sequence of the purifying plant, the sulphur washers are placed after the ammonia washers.

A solution of carbonate of potash has basic properties. Carbon dioxide is absorbed, and causes the formation of bicarbonate:

$$(1)\quad K_2CO_3 + CO_2 + H_2O = 2KHCO_3$$

It is evident that potash will also take up the other weak acids, such as sulphuretted hydrogen and cyanogen. In practice this is what really occurs, and they are absorbed with the formation of bicarbonate:

$$(2)\quad \begin{aligned} H_2S + K_2CO_3 &= KSH + KHCO_3 \\ HCN + K_2CO_3 &= KCN + KHCO_3 \end{aligned}$$

When foul gas is treated with a solution of carbonate of potash, the impurities are absorbed, and the gas leaves the washer in a purified state. The washing is very active: A solution of 17 per cent. of K_2CO_3 is saturated with 0·80 per cent. of H_2S; one of 25 per cent. with 1·20 per cent. H_2S; and one of 60 per cent. with 3·80 per cent. H_2S. Coal gas treated in the customary manner with oxide of iron contains 60 grammes (926 grains) of sulphur in 100 cubic metres (3530 cubic feet); but the same gas treated with potash lye will contain no more than 35 grammes (540 grains). This is also the case with the cyanogen, which is almost totally absorbed.

The great merit claimed for the Petit system is that the potash solution can be perfectly regenerated by an exceedingly simple method. Air is passed through the saturated solution, and after some time it will have taken out the sulphuretted hydrogen and cyanogen, and the solution will be again in a working condition.

$$(3)\quad \begin{aligned} KSH + KHCO_3 &= K_2CO_3 + H_2S \\ KCN + KHCO_3 &= K_2CO_3 + HCN \end{aligned}$$

Air does not remove from a neutral solution the two gases named; and the special feature is that the carbonate is present in the form of bicarbonate. The air leaving the regenerating liquid contains about 2 per cent. of sulphuretted hydrogen, and it may be treated for the production of free sulphur or of sulphuric acid. Of course, this is only remunerative in large gas-works and with installations of coke-ovens. In small works the sulphur-laden air has to be conveyed into the chimney.

The influence of the amount of carbon dioxide in the gas will now be considered. In ordinary practice, most gases contain a certain amount of CO_2. Coal gas, for instance, has generally 1·5 or 2 per cent.; coke-oven gas has slightly more—viz., 2 or 2·5 per cent.; and carburetted water gas plants, in regular working, about 3 per cent. As carbon dioxide is also absorbed by a solution of potash, the question arises whether the sulphur extraction is interfered with by the amount of CO_2. Experiments have shown that, as a matter of fact, the absorption of sulphur is retarded, but that with low percentages it is by no means impossible. One is inclined to suppose that during the washing process all carbonate is converted into bicarbonate, causing the elimination of the sulphuretted hydrogen already absorbed. This is not the case; for between the carbon dioxide in the gas and the carbonate and bicarbonate of potash in solution equilibrium is set up.

When air is passed through a solution of bicarbonate of potash, this salt is partly dissociated, and the air takes up a certain amount of carbon dioxide.

Amount of $KHCO_3$.	Temperature.	CO_2 in Issuing Air.
210 grammes per litre ..	19° C. ..	5·2 per cent.
105 ,, ,, ,, ..	,, ..	2·6 ,,
53 ,, ,, ,, ..	,, ..	1·3 ,,
27 ,, ,, ,, ..	,, ..	0·7 ,,

The air will remove a portion of the carbon dioxide until equilibrium is produced; then there is in the solution a mixture of carbonate and bicarbonate of potash. When, on the other hand, we come to take a solution containing directly a mixture of carbonate and bicarbonate, equilibrium is much sooner reached, and dissociation of carbon dioxide comes to a standstill.

Grammes per Litre		Temperature.	CO_2 in Issuing Air.
$KHCO_3$	K_2CO_3.		
230	—	19° C.	5·7 per cent.
216	10	,,	3·7 ,,
202	20	,,	1·6 ,,
188	30	,,	0·6 ,,
160	50	,,	0·1 ,,

Of course, the influence of temperature is very great, as is generally the case with all dissociation phenomena. Taking, for instance, a solution with 170 grammes of $KHCO_3$ per litre, the figures are as follows :

Temperature.	CO_2 in Issuing Air.	Temperature.	CO_2 in Issuing Air.
5° C.	2·5 per cent.	21° C.	5·2 per cent.
12° ,,	3·4 ,,	26° ,,	6·4 ,,
16° ,,	4·2 ,,	30° ,,	7·5 ,,

In practice, the result will be an equilibrium in the solution between sulphuretted hydrogen, carbon dioxide, and carbonate and bicarbonate of potash, and when this equilibrium has been obtained the liquor is saturated.

During the regenerating process, the air passing through the solution will not only take out the sulphuretted hydrogen, but also part of the carbon dioxide. The regenerated liquor is therefore also in the condition to take out some carbon dioxide from the gas in the next washing operation, and the CO_2 is lowered to about 0·5 per cent.

The foregoing theoretical explanations furnish the reason for a pure solution of bicarbonate of potash also taking out sulphuretted hydrogen. The treated gas begins with the elimination of as much carbon dioxide as will set up equilibrium, and then the absorption of sulphuretted hydrogen takes place. In the regeneration process, the air serves only as a carrier for the issuing gases, carbon dioxide, and sulphuretted hydrogen, and is not the cause of any oxidizing process. Liquors which have served fifty times contain no sulphur salts; and the amount of cyanogen does not in general cause any formation of sulphocyanides—this only being the case when the ammonia washing is insufficient.

A method has been sought to increase the speed of the regeneration process. It has been found that a slight addition of carbon dioxide to the air increases the velocity considerably; for in this case the bicarbonate in the solution is less dissociated, and sulphuretted hydrogen is much more easily driven out. But, on the other hand, the amount of carbon dioxide should not be too high, as the liquor will not have sufficient activity. It has been found that 2 or 3 per cent. will do; and this is very easily effected by mixing chimney gases with the air. It is of some importance, however, that no sulphur dioxide or trioxide should be present in these gases. The heating of the saturated liquor to 40° or 50° C. during regeneration will also increase the process considerably.

The chemical control of the process is very simple, and may be carried out by a skilled foreman. It is done with acetate of lead paper. The regenerative process is tested by means of a solution of nitro-prussiate, and is to be continued until this reagent no longer takes a purple colour with the liquor. The amount of sulphuretted hydrogen in the washing liquor is estimated with a decinormal solution of iodine.

Increase in the Price of Mantles in Germany.

The "Journal für Gasbeleuchtung" of the 4th inst., reported that it had received a circular stating that at a joint meeting held in Berlin on July 19, of the Union of German Mantle-Makers and the Association of Independent Mantle-Makers, the question of an increase in the selling price of mantles was considered, and it was decided that, in view of the considerable increase in the cost of manufacture, the retail price should be raised by pf. 5, making, with the similar increase at the end of March last, a total increase of pf. 10 [1·1d.] since the outbreak of war. This increase refers to the ordinary size of mantle for upright and inverted burners. For other mantles, the increase varies according to their size and quality. The circular states that the increase in the cost of manufacture has been brought about specially by the impossibility of importing certain raw materials, and by the State embargo on certain chemicals, which are used directly or indirectly in the manufacture. Quite recently there has been a particularly great increase in the price of thorium nitrate—consequent on certain acids which are absolutely necessary for its manufacture having been expropriated by the State.

Companies Trading with the Enemy.—A Royal Proclamation has been issued in a supplement to the "Gazette" stating that doubts have arisen respecting the position, under the Proclamations relating to Trading with the Enemy, of incorporated companies or bodies of persons which, though not incorporated in any enemy country or in territory in hostile occupation, carry on business in any such country or territory. The expression "enemy," notwithstanding anything in the said Proclamations, is therefore declared to include, and to have included, any incorporated company or body of persons (wherever incorporated) carrying on business in an enemy country or in any territory for the time being in hostile occupation.

TRANSPORTATION OF NATURAL GAS.

In the earlier days of the supply of natural gas, great difficulty was experienced in constructing a pipe-line sufficiently good and cheap to make the commercial transportation of the gas feasible for any great distances. It was stated by Mr. J. P. Fisher, in a paper recently read before the American Society of Mechanical Engineers, that in order to meet the troubles which arose a new type of coupling was developed, consisting of a centre-piece, which slipped over the ends of the two lengths of pipe to be joined, two glands or end rings, two rubber packers, and connecting bolts between the two end rings—the whole forming a double stuffing-box arrangement. This coupling proved to possess many advantages over any form of joint previously used; and with it lines that were very nearly free from leaks, if sufficient care was taken in their construction, were found possible. Lines could also be made of lighter pipe, and still carry the same or higher pressures than was possible with threaded joints. This improvement has greatly increased the distance it is possible to transport gas profitably; and, though the joint has many grave weaknesses, it is the best available at the present time.

Recently there have been some short lines laid in which the pipe was welded together end to end. This practice is too new to prove its success; but it seems to promise the solution of difficulties due to leakage and deterioration of the rubber-packed joints now commonly used. Like pipe joined by screw joints, the line will be subjected to heavy strains due to temperature changes; and it is likely that special provisions in expansion joints will have to be made for this condition.

In the early days, the natural pressure of the gas as it occurred in the fields was the source of power used for its transportation. As the fields neared exhaustion, or when the distances from the fields to the points of consumption were too large, the pressure fell too low; and it became necessary to increase it artificially by means of compressors of one type or another. In many of the earlier plants, attempts were made to locate these compressors in the towns and draw the gas through the lines by suction. These attempts failed; and it became the practice to locate the stations in or near the fields. At the present time, practically every gas transportation company has to keep up a system of compressing stations in order properly to maintain and control the amount of gas passing through its lines.

Most of the larger natural gas systems of the country have been the result of a process of evolution in which lines were extended farther and farther to reach one field after another, and in which one compressing station after another has been built, usually for the purpose of putting gas from a declining local field into the main trunk line. Another factor in this evolution has been the necessity of small companies combining in order to be able to go to greater distances for a common additional supply, when the old sources of supply were exhausted.

It is, says the author, estimated that the gas escaping from the Cushing field [one of the main sources of supply in the Mid-Continental region] is about 400,000,000 cubic feet per day, or about 11,000 tons. This would be equivalent in fuel value to a train load of coal of 300 to 400 cars of average capacity. Of the gas in this field, only about 10 per cent. ever gets into a pipe-line or is used as fuel. The problem here is mostly one of proper government and control, so far as the community at large is concerned, and financial, so far as the transportation company is concerned. As the gas in the Cushing field comes from the well, it is very far from pure or a perfect gas. It is composed largely of methane, with considerable quantities of the heavier hydrocarbons, ranging from those which at ordinary atmospheric conditions are vapours and are considered as part of the gas proper, down to heavy oils, and often salt water. The liquids are held in suspension as a fog or mist, or run along the bottom of the pipe and collect in low places. Between these extremes are all those compounds usually known as gasoline or flashy gasoline. Dirt, sand, &c., are also often present.

The first problem in the transportation of this gas was to separate dust and dirt, and such liquids as water, oil, or gasoline. For this purpose drips or separators were provided in the lines from the wells to the main trunk line. Any liquid not taken out by the field-drips tends to collect in low sections of the line, and drips should be provided at all these low points. If pockets of liquid occur in the line, they cause the flow of gas to be pulsating instead of steady. This pulsating is difficult to entirely overcome, and is one of the chief sources of trouble in the operation of measuring stations.

Gasoline and oil are the main cause of rapid deterioration in the joints in the pipe-lines, which are usually packed by rubber or composition rings. The oil and gasoline attack the rubber rings quite actively, and sooner or later cause leaks and blow-outs—especially as the pressure carried in the line is from 200 to 400 lbs. per square inch. Several substitutes for rubber are being used, and seem more resistant; but the only way to eliminate trouble from this cause is to keep gasoline and oil out of the line.

An idea of some of the problems incident to a compressing station may be obtained by a consideration of a typical compressing station of approximately 3000 H.P., which is capable of compressing about 40,000,000 cubic feet of gas per 24 hours through three compressions and delivering it at 350 lbs. gauge pressure. Up to this station the gas is transported by the natural field pressure. The prime function of the station is to re-compress the gas, which has dropped to a pressure too low for economical transportation, to a pressure high enough to deliver the requisite quantity through the remainder of the line right up to the points of consumption.

One of the chief problems is that of the condensation of gasoline in the line beyond the station. As the gas leaves the field, its pressure has been diminishing and its capacity for carrying gasoline as a vapour increasing. There is, therefore, little danger of deposit of gasoline in the line between the field and the compressing station. At the compressing station, the pressure of the gas is raised to 300 lbs. per square inch, or higher, and its temperature raised to from 210° to 240° Fahr. After compression, the gas is passed through a cooler, consisting of a large number of pipes in an open pond of water. Only occasionally is the temperature in the cooler low enough to condense out any great proportion of the vapours condensable at this pressure and line temperature. A separator is provided at the outlet of the cooler; but it can only take out vapours already condensed. It is, therefore, apparent that there is a possibility of further condensation of gasoline in the pipe-line beyond the compressor station; and this is exactly what occurs.

One very important function of a natural gas line is the equalization of the rate of production. The demand for gas in a city varies greatly from hour to hour of the day, being several times as great in the daytime as at night; and it also varies greatly with atmospheric temperature. It would be a difficult matter to vary the output of a compressing station or a field at a distance from a town to meet the widely varying demand, if it were not for the equalizing effect of the transmission line. When the supply is greater than the demand, the gas is being stored in the line, and is available when the demand suddenly becomes much greater than the rate of supply. Often this equalizing effect will enable gas to be taken into the line at a uniform rate from the field for days at a time, while the demand at the other end of the line is fluctuating widely.

Finally, regarding the problem of transporting gas by means of pipe-lines and compressing stations, remarks Mr. Fisher, the gas fields are not only stores of latent energy in the form of fuel, but also stores of latent energy directly available as power in the highly compressed state of the gas. At present the pressure energy is used quite wastefully in the transportation of the gas itself. If, instead of allowing the pressure of the gas to drop to one-third or one-fourth of its initial value before re-compressing it, the pressure could be maintained at a high point, a great reduction in the total power required to transport the gas could be made. This would point to smaller compressing stations located at shorter intervals along the line. These stations would require less total power than stations at greater intervals performing the same service; and they could be simplified greatly by the omission of the after-cooler, as the smaller range of compression would not raise the temperature of the gas to an objectionable point.

USE OF TAR FOR DUST PREVENTION AND ROAD PRESERVATION IN AMERICA.

A professional paper—Bulletin No. 257 of the United States Department of Agriculture—is a contribution from the Office of Public Roads, which gives reports on the progress of experiments on dust prevention and road preservation carried out in various parts of the United States last year. Many of them are in continuation of experiments begun in earlier years, and consist in the re-surfacing or renewal of test sections of road which had shown signs of wear or failure.

The experiments deal with many oil and asphaltic preparations, but a certain number relate to trials of prepared coal tar and water gas tar. The particulars given of these materials and the general results of the experiments with them have been abstracted in the appended table. It will be seen that few of the tars used fulfil the requirements of the Road Board of this country; and in cases where unsatisfactory results are reported they may be clearly traced to the unsuitableness of the grade of tar used. In considering the results recorded, attention should, however, be given to the climatic conditions of the district in which each experiment was made.

The data given may, as a whole, be of service to distillers and surveyors in this country, as a guide to the composition and characteristics of tar preparations for use in the treatment of roads. Generally speaking, it may be said that the oil and asphaltic materials, on which reports are included in the same paper, have not shown a higher proportion of satisfactory results than the tar preparations referred to in the table.

Results of Experiments on the Use of Tar for Dust Prevention and Road Preservation in America.

Place.	Lemon City, Florida.		West Palm Beach, Florida.		Rockville Pike, Maryland.	Washington, District of Columbia.	Chevy Chase, Maryland.
Nature of Stone or Road Crust.	Screened Coralline Rock.		Screened Coralline Rock.		Tarred Macadam.	Tarred Macadam	Tarred Macadam.
Method of Applying Tar.	Surface Treatment.	Penetration.	Penetration.	Penetration.	Renewal of Tar Coating.	Renewal of Tar Coating.	Renewal of Tar Coating.
Temperature of tar on application	Cold	194° F.	347° F.	365° F.	150–175° F.	Cold	Cold
Nature of tar. .	Water gas tar preparation	Water gas tar preparation.	Refined coal tar	Refined coal tar	Refined water gas tar	Water gas tar preparation	Crude coal tar
Tar per square yard, Imperial gallons . . .	No. 1, 0·21, and No. 2, 0·35	No. 2, 0·90	No. 1, 0·81, light coal tar (cold) 0·27	No. 2, 1·0	0·245	0·147	0·263
Condition of road about twelve months after treatment . .	Fine grained Mosaic surface; a few incipient potholes	Perfect Mosaic surface with slight indentations	Good, but bituminous materia become hard and brittle	Tar become hard and friable. Surface treatment with tar required	Surface good, especially where ⅜ in. gravel had been used as covering material instead of trap rock chips	Reddish brown colour: worn off in well-defined areas, but generally smooth and uniform	Surface smooth and hard; a few irregularities only
Analysis of tar .	No. 1	No. 2.	No. 1	No. 2	..	..	..
Specific gravity 25° C.	1·084	1·120	1·288	1·282	1·123	1·091	1·146
Specific viscosity Engler . . .	13·3 (100 c.c. at 25° C.)	24·5 (100 c.c. at 50° C.)	—*1	—*2	27·0 (50 c.c. at 50° C.)	18·4 (100 c.c. at 50° C.)	5·0 (50 c.c. at 50° C.)
Distillates: Per cent. by weight:							
Water . . .	0·0	0·0	0·0	0·0	0·0	0·1	3·0
Light oils to 170° C.	1·3	1·1	0·5	0·6	0·6	1·2	3·0
Middle oils, 170-270° C.	31·1	17·5	3·0	3·4	23·4	20·0	20·0
Heavy oils, 270–315° C.	12·5	11·7	9·4	9·0	12·5	9·5	11·3
Appearance of—							
Middle oils . .	Clear	Clear	Cloudy	Cloudy	One-fourth solid	Clear	Clear
Heavy oils . .	Clear	Clear	One-eighth solid	One-fifth solid	One-fourth solid	Clear	One-third solid
Residual pitch .	Hard, glossy	Hard, glossy	Hard, dull, brittle	Hard, dull, brittle	Fairly hard and glossy	Soft, sticky, semi solid	Hard, fairly dull, brittle
Free carbon in tar, per cent. .	1·54	1·75	29·61	28·30	0·80	2·22	8·62

*1 Float test at 50° C. = 4 min. 18 secs.

*2 Float test at 50° C. = 3 min. 33 secs.

World's Production of Petroleum in 1914.—The "Iron Age" (New York), giving statistics of the world's production of petroleum in 1914, taken from a return compiled by the United States Geological Survey, says that the quantity of petroleum entering the markets of the world in that year amounted to 400,483,489 barrels (of 42 gallons). Of this record output of oil, the United States is credited with the production of no less than 66·36 per cent.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Dublin Gas Company.

SIR,—Your correspondent, "Anticipant," appears to have correctly foreseen the financial position of the above Company, as it is now disclosed in the Directors' report.

While I have always read Mr. R. W. Edwards' ["Nonulus"] letters with profound interest, he may, having now seen the Directors' report, have views differing from those conveyed in his letter to you of the 9th inst. In the past, he has shown so much ability in dealing with the Company's affairs that I am content he should continue to exercise the same vigilance without my aid. It is quite true the form of the accounts has been changed, which makes comparisons difficult; but in view of the high standing of the Company's Auditors, we shall look forward to Mr. Edwards' comments of the accounts, as now presented, with added interest.

"Anticipant" seems to be of opinion that the primary cause of the financial disaster was want of administrative ability on the part of the Board of Directors, with which I agree. The balance-sheet now before me fully substantiates this view. It cannot be suggested that the enhancement in the profits has arisen through radical re-organization or additions to the works' plant, although doubtless something has been done under the able direction of the Company's Consulting Engineer, Mr. Newbigging. Time, however, has not permitted anything material being done in this respect; in fact, the accounts reveal £2200 only as having been spent during the past half year.

The point to which I venture to direct the shareholders' attention is the immediate future. The former Board of Directors have exhibited, as the comparison referred to shows, the most lamentable want of business capacity possible to conceive. They ran the Company's affairs on to the rocks, to which they were seen drifting for some years; but they refused to listen to competent criticism, until at last the crash came. The shareholders took command, and have in so short a space of time re-floated the concern in comparatively smooth water. Are the shareholders to continue to give their confidence to men who have acted in such a way, and shown such magnificent incapacity?

The additions to the Board, appointed at the shareholders' meeting in March, 1914, have (as ordinary business men would do) seen to the business administration of the undertaking with results which are gratifying. There is, doubtless, much that can yet be done in the vital equipment of the works, which will spell still greater economies; but I wish to emphasize the point that what has been lacking in the past is ordinary business capacity to administer such a trading concern, and that those who are left of the old directorate must be swept aside to make room for competent business men.

If it is not going too far, I would say that the administration of this Company has, in Dublin, been a byeword for years past; and it is not to be expected that competent business men such as Dublin possesses more than enough of, would be associated with men who have proverbially administered such an important service with such lamentable disregard of the shareholders' and the public interest; for not only have the shareholders lost, but the gas consumers of Dublin have paid tens of thousands a year more than they need have done, had the Company been in the hands of competent men.

If, therefore, the shareholders' and the consumers' position is to be secured in the future, some drastic steps will require to be taken between now and the meeting in March, when the re-election of the Directors takes place, to organize the shareholders, and make adequate provision for the future administration of the Company.

I was one who disapproved of the new Directors' policy of excluding from the Board men of proved gas experience; and while the showing is good so far, with their aid it would have been better.

The new Directors are silent as to the experts' report. How much has been carried out, and what yet remains to be done? They have not as yet appointed a competent man as Engineer and Manager of the works, such as all other companies deem it expedient to do.

How, therefore, can the shareholders have any confidence in a Board totally ignorant of the technical side of the business they are conducting, upon which the profits ultimately rest, and who seem to delight in relying exclusively on their commonsense business ability.

It is true the Board is being advised by a Consulting Engineer of eminence; but a Consulting Engineer is not the same as a General Manager and Resident Engineer, as all gas authorities know well.

The care which the Lancashire members of the Board have given to the Company's affairs is shown by the results they have achieved, and is some indication of the frequency of their journeys to and fro. It is not to be expected that they should continue indefinitely to devote so much time to the Company's affairs. Their shareholding interest is not large; and I would strongly urge very grave consideration being given to the future administration of the Company. The members of the old directorate still on the Board should have the grace to retire or be pushed out. Competent business men in Dublin should be added to the Board—sufficient in number to establish the Board on its statutory basis. The Board so constituted should procure the services of the best man they can lay their hands on, as Engineer and General Manager of the undertaking, resident in Dublin.

Given such organization, the future of the Company is assured. Alternatively, the exclusive policy of the new members of the Board, which they have shown some indication of pursuing, will assuredly run the concern again on the rocks in the course of a few years.

FUTURIST.

Sept. 17, 1915.

Radiant Heat Distribution.

SIR,—With some reluctance, I return to this subject. The *crux* of the whole question is, as you appear to realize, which is the best for distributing "radiant heat"—the straight or rounded fire—for practical purposes. Whether you have grasped the real principles of radiation is not so apparent. You speak of "concentrated radiant heat." How radiation from a gas-fire, which disperses in straight lines and in all directions, can at the same time be concentrated (which, according to the dictionary, means "to bring to a common centre, point, or focus") is to me a scientific revelation.

Reverting to the point of what really does happen, and which has been the whole purport of my two previous letters, it is now apparent that your advocacy of the round-front has been based on a misconception of radiation principles. From your comments, it now seems that your advocacy has been based upon the assumption that the round-fronted fire will be used for "straight filled-in mantels and not recessed ones." I am glad you have assisted me to make it clear that there is no advantage in the round-fronted fires with ordinary fireplaces, as they are intended for fireplaces which would have to be specially filled in. You therefore concede my point [third paragraph, p. 591] that "increased area, by altering the design, is of little practical use in room heating with the big majority of modern room fixtures." Another point conceded is that circular fuel placement is not new. It has yet to be proved that the round-fronted fire gives an increased radiant efficiency.

With regard to air movements bringing out the products, it would appear that you have relied solely upon your senses, and not upon scientific tests. It is generally recognized that there is practically no smell in up-to-date gas-fires; but this in itself is not sufficient proof that products are not brought out.

JAS. W. WILSON,
(Wilsons and Mathiesons, Limited.)

Leeds, Sept. 17, 1915.

[Mr. Wilson this week plays upon words and assumptions. He appears to think that we have not grasped the real principles of radiation. Our friend is obviously readily persuaded by the processes of superficial reading and stripping words bare, which is not complimentary in controversy. What is the ground for his fancy regarding a deficiency on our part of knowledge as to the principles of radiant heat distribution? It is that (so he says) we spoke of "concentrated radiant heat," which, of course, we did not do. He goes so far as to consult a dictionary to assist in the work of unfairly representing our statement; and he finds the dictionary he referred to states the meaning of the word "concentrated" to be "to bring to a common centre, point, or focus." Our correspondent, for the purpose of making a point in argument, was blind altogether to the context of the word "concentrated" in our reply to his letter last week. Let us repeat what we said, so as to impress it better on his attention: "The real question is which is the *better distribution* for practical purposes—the *more* concentrated or the *more* distributed heat." We ask his particular observance of the italicized words used in connection with the word "concentrated." Among the lexicon meanings of "concentrate" we believe are: "To bring into closer union," "to bring into narrower compass," "to condense." We used the expression "*more* concentrated" (we will not insult Mr. Wilson's intelligence by assuming that he really thought otherwise) in a relative sense, as the word "more," we imagine, clearly shows, and precisely in the same way as our correspondent spoke, in his first letter, of the radiant heat from a straight-fronted fire "effectively warming anyone sitting in a chair on *any part of the hearthrug*." In the same way, too, as he stated, in his second letter: "Neither can you increase the radiation distribution area, unless the gas consumption is also increased to make good *the losses in the direction in which radiation has hitherto been regarded as most useful*." And again: "You must have a larger fire area, and therefore a larger consumption of gas, to get *in* the *usable part* of the room *the same amount of heat* as you get from a straight-fronted fire." Our correspondent must be thanked for providing the necessary illustrations to enable him to comprehend the meaning of "*more* concentrated" and "*more* distributed" radiant heat, in relation to "better *distribution* for practical purposes." Mr. Wilson also appears to contend that "recessed fireplaces" are "ordinary" ones. They do not happen to be so in the houses of the great majority of people; and the large number of gas-fires in use are set in front of a coal-grate (with or without the bars removed), or with the mantel filled-in as shown in the illustration on p. 445. Again, we will not insult our correspondent's intelligence by saying that this is news to him. With Mr. Wilson on one's track, it is evidently very necessary to be scrupulous as to terms, although he is not so. When we remarked on the "*new line*" of fuel placement, naturally there was no intention on our part of suggesting that no one had ever before tried a curved line of fuel placement. But the semi-circular placement has not been the normal line in gas-fires; nor have we ever seen it in a fire on the market (other than circular ones) with vertical fuel. The Richmond semi-circular fronted fire is, taken as a whole, new in design and certain structural features. With regard to air movements, and Mr. Wilson's statement that "you have relied solely upon your senses and not upon scientific tests," let us remind him of what we said on p. 494: "The point has, we know, been well in the mind of the firm in designing the fire; and it has been placed under *long test*." Therefore, we are not relying "solely" on our "senses"—our "senses" with ordinary straight-fronted fires are *plus* the "long test" with the semi-circular fronted fire.—ED. J.G.L.]

Benzol Recovery.

Sir,—In his article on "Benzol Recovery from Coal Gas," which appears in the "Journal" for Sept. 14, Mr. W. R. Herring records the fact that by adding 5 per cent. of benzol to a washing oil, the drop in the illuminating power of the washed gas is smaller than when a non-benzolized oil is used.

It would be very strange if it were otherwise; but on what grounds does Mr. Herring conclude that the benzolized oil is suitable for use in a rotary washer? It would be useful to know how much of the toluene in the gas was removed by the non-benzolized oil, and how much by the benzolized oil. No figures relating to the amount of toluene extracted are given in the article, although this must be the deciding factor as to the suitability of the process.

Other gas engineers besides Mr. Herring have expressed astonishment at the small loss in the illuminating power of a gas stripped of its naphtha (so-called benzol). Yet this is only another illustration of the fact established many years ago by Professor Lewes, that the illuminating power of gas is by no means the sum of the illuminating power of its constituents.

"Ignoratio Elenchi."

Sept. 17, 1915.

Training and Education of Gas-Fitters.

Sir,—Thanks, no doubt, to the wretched acoustic properties of the room in which the meeting of the North British Association of Gas Managers was held, your reporter has made one or two mistakes in his report of my contribution to the discussion on Mr. Cowie's paper which I should like to correct, as they made nonsense of what I said. The report reads that some excuse for the invitation which had been extended to me to take part in the discussion might be found in my connection "with the Metropolitan gas industry." This could hardly have been considered a valid excuse. The excuse that I tendered was my connection with the British Commercial Gas Association, which, as I remarked, was as much a Scottish as an English, Welsh, or Irish affair.

Then I am reported as saying that "during the last century those associated with the gas industry had exercised themselves in the protection and perfection of machinery and the article produced by machinery." If the word "production" is substituted for "protection" the report would be much more near what I actually said. The words "and protect" should be deleted in the next sentence; and three lines further down the words "gas supply" should be substituted for "gas inspection."

F. W. Goodenough.

Sept. 14, 1915.

Supply of Thorium Nitrate.

Sir,—Will you permit us to correct the letter of Mr. M. H. Hersey, appearing in the "Journal" for Aug. 25, in which he intimates that there is only one firm who can supply thorium nitrate. Since January last thorium nitrate made by this Company, averaging 48 per cent. oxide, has been offered in very liberal quantities to all English mantle manufacturers. We use monazite sand obtained in India, and manufactured by us into thorium nitrate in our own works in Chicago.

This Company is in no way associated or connected with any syndicate or trust. All raw material made by the Company is for its own needs primarily; but, incidentally, it may be mentioned that our capacity is such that we can manufacture large quantities of thorium nitrate to supply other manufacturers in this and other countries.

For the Lindsay Light Company,
Charles R. Lindsay, President.

Chicago, U.S.A., Sept. 8, 1915.

The War Bonus Question at Oldham.

There has been a sharp development of the war bonus controversy at Oldham between the Corporation and the members of the Gas Workers' and General Labourers' Union; and at a meeting of the Committee of the Oldham branch early last week it was decided to take a ballot of the men—the Corporation having in unmistakable terms twice previously refused to grant an all-round war bonus of 3s. per week. On the other hand, they made an offer of 2s. per week bonus; but this the men rejected. At the meeting referred to, Mr. J. R. Clynes, M.P., the General Secretary of the Union, reviewed the position of affairs [see "Journal" for Aug. 29, p. 409], and said the decision to ballot the men had been arrived at because the Corporation had refused to consider their claims. The Committee had decided to issue ballot-papers which would be returnable by the end of this week; and the men would be asked to say whether they were in favour of the Union tendering notices to cease work in order to press their original claims for a bonus of 3s. With the ballot-papers a statement of the men's position would be given, in which it would be pointed out that the decision of the Corporation to give a bonus only to men receiving less than 30s. per week left out a large number who were doing the hardest work, and who had also to work on Saturdays and Sundays. Should the men decide to cease work, it will be necessary for fourteen days' notice to be given by those employed in the Gas Department (680) and Water Department (105).

◆

Cardiff Gas Company's Gift.—The loyal action of the Cardiff Gas Company received warm recognition last Wednesday, when the local Technical Education Committee thanked the Company and Mr. George Clarry (the Secretary and General Manager), who is also a member of the Committee, for the gift of a well-equipped building suitable for conducting classes in munition work. The Superintendent of Technical Education (Mr. Charles Coles) presented a report, in which he remarked that it was through the kind offices of Mr. Clarry that the Gas Company had erected the building, and provided various necessary tools. Some 200 persons had registered for entry; and the classes commenced yesterday, on the shift system.

REGISTER OF PATENTS.

Production of Producer Gas from Bituminous Fuels.

Dellwik-Fleischer Wassergas Gesellschaft mit beschränkter Haftung, of Frankfort-on-Main, Germany.

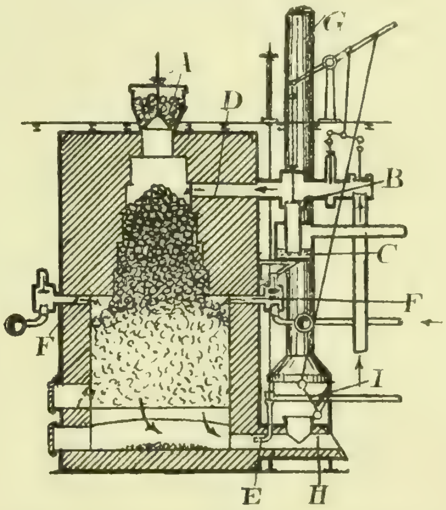
No. 303; Jan. 5, 1914. Convention date, March 12, 1913.

This invention relates to the production of gas from bituminous fuels in a producer in which steam and air are alternately forced through incandescent fuel.

It is already known, the patentees mention in their specification, that the industrial production of high-grade water gas from bituminous fuels (exclusive of coke, anthracite, or charcoal) by means of blast apparatus, encounters very serious difficulties, because the liberation of gas and the coking of the fuel which takes place in the upper part of the fuel column does not keep pace with the consumption in the lower part of the fuel column of the coke necessary for the production of the water gas. According to this invention, these fuels are used in generating a gas containing but little carbon dioxide, by arranging that in a producer through which air and steam are alternately forced—for example, operating according to the Dellwik-Fleischer process set out in patent No. 29,863 of 1896—during the period of gas liberation (that is to say, at the time steam is blown in through the grate) a current of air is blown in in the middle of the column, just sufficient in quantity to distil and coke the freshly supplied fuel at the top of the column. A part of the water gas produced in the lower portion of the fuel column is brought to combustion with this air, almost in the freshly-formed state, and consequently in an economical manner effects the coking of the upper layers of the fuel. Thus essentially air is blown into the generator not only during the blast, but also during the period of liberation of gas.

This operation of blowing in air during the period of liberation of gas, which in the usual kind of producers, through which steam and air are forced alternately, is prevented by a safety partition between the gas and the air passages, is free from danger in the present case, on one hand, because the air current is maintained uninterruptedly—that is to say, during both the blast period and during the period of liberation of gas throughout the producer—and, on the other hand, because the air-blast takes place at a point where material still glowing is situated, and therefore, in consequence of the efficient combustion, the production of explosive mixtures is impossible.

It has already been proposed in a water-gas process to introduce air during the injection of the steam with the object of obtaining a larger volume of poor gas of lower calorific value. This resultant gas would, in all probability, be a mixture of producer gas, water gas, and distilled gas; and its calorific value would be reduced by the nitrogen present incident to the manufacture of the producer gas. In comparison with continuously operating producers in which water vapour together with air enters the furnace in an uninterrupted current, and in which, when necessary, also secondary air is supplied in order to increase the zone of combustion as far as possible, the present process is said to have the advantage that a gas having a very considerably lower content of useless gases is produced.



Dellwik-Fleischer Bituminous Fuel Producer.

The illustration shows the position of the apparatus during the blast period.

The producer at the top, in the vicinity of the feed hopper A, has an exit D for the useful gas which is controlled by the valve B and passes to the receiver C. Further, the producer is provided at the lower end of the fuel column with a steam-duct E, and may be fitted either at the bottom or (as shown) at the top end of the producer with an air supply. In the middle of the column—preferably at the place where the water-gas producing fuel column (which consists of incandescent coke) ends—a tuyere F is arranged.

The apparatus works as follows: The blast period of the fuel column takes place so that the products of combustion escape from the bottom of the producer through the flue G. After the necessary temperature is reached, the steam-valve is opened, and the useful gas thus produced is passed through the tube D and the receiver C to the outside. In addition to the current of steam [and this is said to form the novelty in the present process], air for combustion is introduced into the furnace through the tuyeres F. In this way a part of the water gas is burned, and in consequence the temperature of liberation of gas is greatly increased, so that the mass of fuel which rests above the column of coke is effectively and quickly coked; the hot water gas rising up from below.

The process affords, at the same time, "the possibility of particularly improving the recovery of ammonia with a very small accompanying reduction in the quality of the gas produced." By blowing in combustion air, the additional quantity of heat for coking the upper fuel column can not only be produced, but it is possible without further preparation to increase the quantity of the combustion air to such an extent that the temperature necessary for the liberation of gas can still be maintained when fresh and relatively cold steam serving as the necessary excess of steam requisite for the production of ammonia is introduced, together with the combustion air above the coke column.

Manufacture of Producer Gas.

Dellwik-Fleischer Wassergas Gesellschaft mit beschränkter Haftung, and Koster, P., of Frankfort-on-Main, Germany.

No. 884; Jan. 12, 1914.

This invention is a modification of that described in patent No. 303 of 1914 [see p. 649].

The process described in the parent application presents, it is said, the possibility of improving more particularly the recovery of ammonia in a simple manner by means of quite a small decrease in the quality of the gas produced, because of the proposal to inject air into the furnace above the layer of coke in order to burn some of the combustible gas, and hence raise the temperature at this point to the necessary amount. The principle of the present invention consists in the fact that, on account of this air for burning some of the combustible gas which has risen through the producer, and which air is blown in above the layer of fuel which produces water gas, not only the amount of heat to be added necessary for effective liberation of gas from the upper layers of fuel can be produced (as explained in the parent application), but it is also possible to obtain without difficulty an excess of heat by a suitable amount of this air of combustion in order to fully compensate for the reduction in temperature due to the wetness and lower temperature of the steam injected. Thus the temperature necessary for the proper liberation of gas can be obtained even if near the air for combustion above the column of coke, quite fresh, and therefore relatively cold, steam is introduced in order to form the excess of steam necessary for the recovery of the ammonia.

The process proposed consists essentially in introducing secondary steam as well as air for combustion after the blast period, in addition to the usual steam jet, above the zone of coke producing water gas. This steam is added in such proportions by volume that, in consequence of the special temperature of the upwardly streaming water gas, together with the combustion produced by the introduction of air, such a temperature is obtained that the liberation of gas from the upper part of the column of fuel is completely effected. At the same time the loss of heat due to the introduction of the fresh steam is made up. Moreover, the use of steam with, or close to, the air for combustion has the advantage that only a friable slag can be formed up to the neighbourhood of the blast tuyeres.

Treating Spent Material from Gas-Purifiers.

Bonneau, L. C., of St. Denis, and Hasenfratz, V. E., of Levallois-Perret, France.

No. 10,780; May 1, 1914.

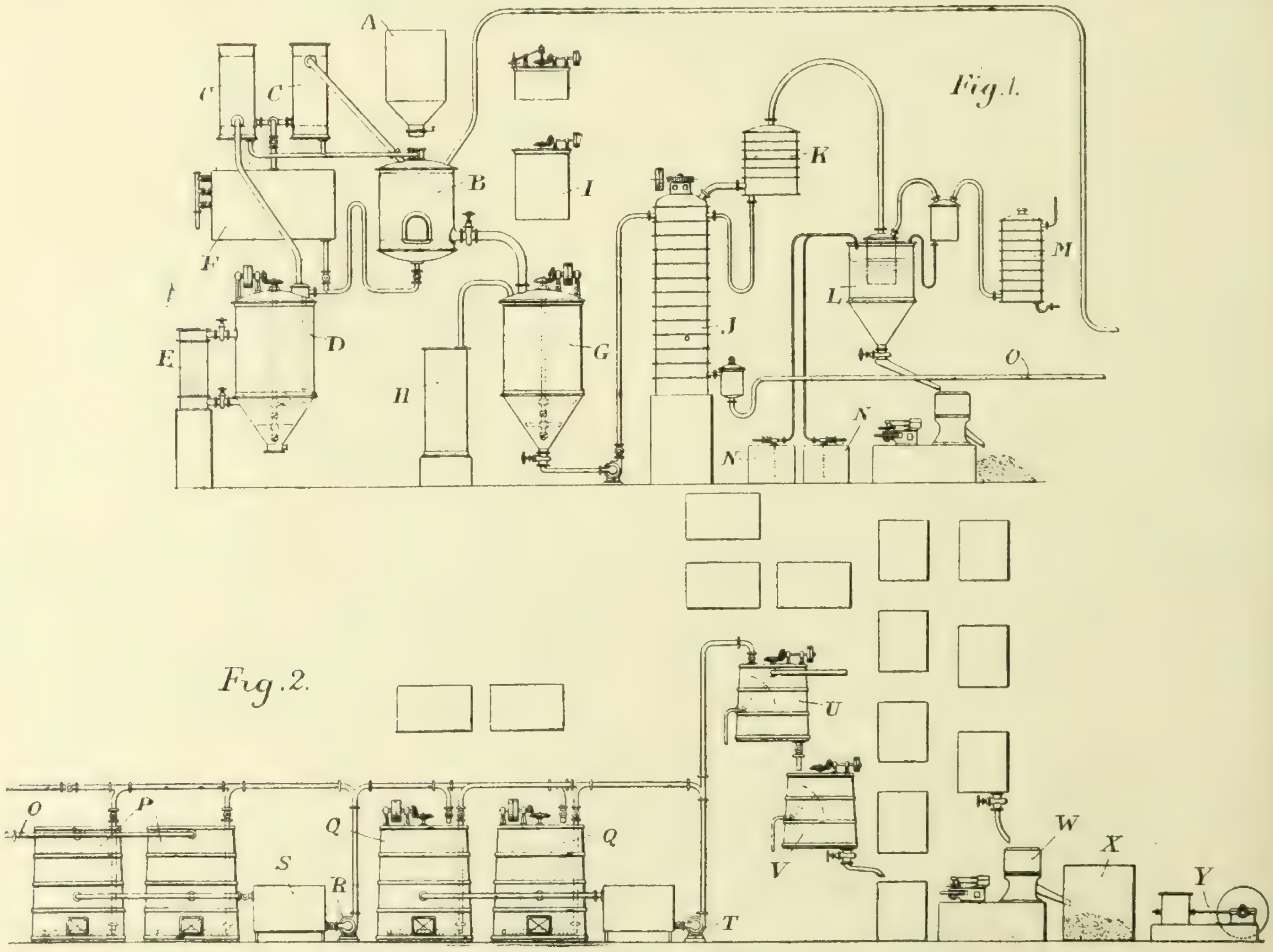
This invention relates to a process for the total extraction of the chemical products contained in the spent material from gas-purifiers. It is said to improve on the known processes in two respects: First, the extraction of sulphur; secondly, the transformation into prussian blue of the impure and insoluble ferrocyanide of iron, and which allows also, as in previously known processes, to recover all the ammonia contained in the materials treated.

Fig. 1 represents all the apparatus employed for extracting the sulphur and recovering the ammoniacal nitrogen; while fig. 2 (which is continuous with fig. 1) shows the arrangement of the apparatus for the preparation of the prussian blue.

The sulphur is extracted in a special digester by a suitable solvent—for example, trichlorethylene. The spent material is contained in the feeding hopper A, and is fed into the digester B, into which is run (at its upper part) the boiling solvent which has been condensed from the condition of vapour in the condenser C—the vapour coming from the reheater D. The solvent contained in the latter is heated by steam in a tubular heat interchanger E, passes through the crude mass contained in the digester, and flows through a filter into the reheater by way of a syphon pipe shown; so that the crude mass is soaked in the boiling solvent before the latter is distilled in the reheater. Here the sulphur remains while the vapour of the solvent passes to the bottom of the condenser and rises until it condenses, when the liquid of condensation falls immediately on the mass under treatment in the digester. In this way the solvent acts on the latter at the temperature of ebullition; the circulation being continued until the whole of the sulphur has been extracted. When all the sulphur has been dissolved, the reheater is still heated, but the solvent flowing from the condenser is passed directly into a reservoir F, to be used in a fresh operation. The free sulphur is removed from the bottom of the reheater.

The fact that the vapours of the solvent passing from the reheater enter at the bottom of the condenser, and consequently are not obliged to traverse it throughout, but are raised only until they are condensed and then fall immediately in the state of boiling liquid into the digester, of which the upper part communicates with the lower part of the condenser, is said to be a "new and very important feature of the invention, since it ensures that the solvent should always have the maximum temperature—that is to say, the temperature of ebullition—when it acts on the material under treatment; besides, the trichlorethylene is more active the hotter it is." It has been already proposed in the extraction of sulphur, the patentees remark, to use an extractor connected by a syphon with the heater and a condenser connected with both heater and extractor; but "the arrangement was not such as to ensure that the solvent acted on the material in the condition of a boiling liquid.

The sulphur having been extracted, the crude mass, which still contains a certain amount of solvent, is mixed with water (which flows into the digester through the pipe shown; and the mixture is passed



Bonneau and Hasenfratz's Treatment of Spent Material from Gas Purifiers.

into a mixer G (provided with a stirrer and heated by direct steam) connected with a condenser H, the purpose of which is the recovery of the trichlorethylene or other solvent still contained in the crude mass and expelled from it by the heating and stirring.

When this operation is at an end, the stirring is continued, and milk of lime, prepared in the vat I from lime contained in the vat above, is fed into the mixer. The milk of lime, on the one hand, liberates the ammonia contained in the ammoniacal salts, and, on the other hand, begins the operation having for its object the extraction of the blue by transforming the impure and insoluble ferrocyanide of iron into soluble calcium ferrocyanide, and thus eliminating all insoluble matter. The mass is heated to ebullition; a part of the ammonia distils, and when the transformation of the ferrocyanide is completed the whole mass is transferred by means of a pump into the column still J (provided with rotary plates), in which the distillation is conducted. The ammonia liberated is preferably first passed through another distilling column K and is then received in a sulphuric acid saturator L, where it is converted direct into sulphate. The sulphate is discharged from the saturator into a centrifugal drum, where it is dried and from which it is discharged as shown. The vapours not condensed in the condenser M are transmitted to the boiler furnace to be burnt. As to the residual solid material, when this has been re-oxydized it may be used again with advantage. At N are shown the reservoirs of acid and other liquor.

When the ammonia has been distilled in J, the contents of the still containing calcium ferrocyanide in solution are passed through the pipe O into vats P, where settlement occurs; and the clear liquid is conveyed to the further vats Q, which are provided with stirrers and are heated by steam. The water employed for washing the solid matter is used for mixing with the crude material in the digester B after the sulphur has been extracted from it. For this purpose the water is conveyed by means of a pump R. A reservoir S permits recovery of the water which has been used for the second and third washings.

The liquid contained in the vats Q is boiled, and then there is added a suitable proportion of potassium chloride, which has the effect of transforming the soluble calcium ferrocyanide into insoluble double ferrocyanide of calcium and potassium, which is rapidly precipitated. All the soluble matters are thus eliminated.

The liquid is decanted, and to the residue is added (together with an appropriate proportion of water) a suitable proportion of sodium carbonate—the mixture being boiled for some time. Double ferrocyanide of calcium and potassium is transformed into double ferrocyanide of potassium of sodium, which is soluble; while the lime becomes insoluble carbonate of lime, which rapidly settles. The vats containing potassium chloride and sodium carbonate are shown above the vats Q.

The clear liquid from these latter vats is conveyed, by means of a pump T, into a vat U, where it is mixed with sulphuric acid until the liquid is slightly acid. A suitable quantity of ferrous sulphate is dissolved in boiling water; and this solution is added, while boiling, to the double ferrocyanide. There is at once produced a white precipitate which is passed into a vat V, where it is peroxidized, by pure sodium hypochlorite or by hydrogen peroxide, so as to obtain prussian blue. The vats shown above are to contain sulphuric acid, ferrous sulphate, and sodium hypochlorite or hydrogen peroxide. The prussian blue discharged from the vat V is conveyed into one of the latter vats, where it is subjected to several washings by decantation. The blue is finally dried by means of a centrifugal drum W, and then passed into a stove X, where it is also subjected to the action of a vacuum produced by a pump Y.

In concluding their specification, the patentees remark: We are aware that it has been proposed to treat spent material from gas-purifiers with a volatile solvent to extract the sulphur, to add milk of lime to the residue, and distil off the ammonia, and to convert the calcium ferrocyanide solution into alkali ferrocyanide—for instance, by adding potassium chloride, and then treating the precipitated calcium potassium ferrocyanide with sodium carbonate; and they do not claim this process *per se.*

Incandescent Gas Flash-Light Apparatus.

Svenska Aktiebolaget Gasaccumulator, of Stockholm.

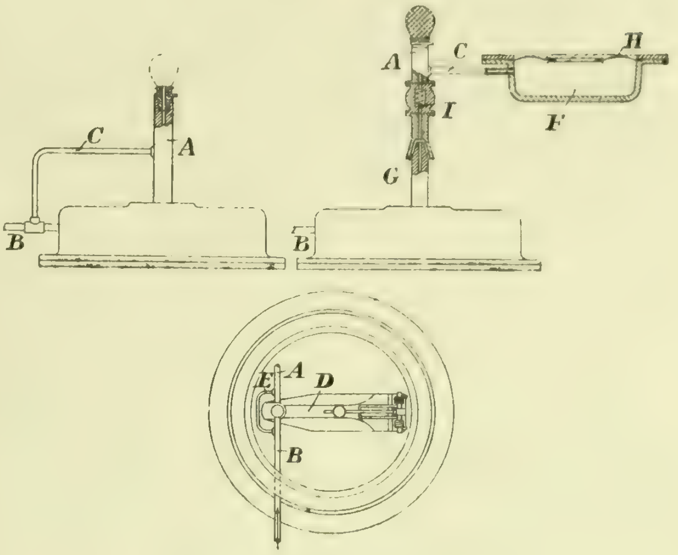
No. 17,569; July 24, 1914. Convention date, Aug. 1, 1913.

This invention has for its object to so construct the incandescent gas flash-light that the incandescent body shall be "more durable than is the case in the heretofore usual arrangements of this kind." In apparatus to which the invention relates, the patentees point out that the main flame is active a great number of times a minute, and the incandescent body is consequently subjected to great strain; moreover, to avoid any deposit of soot on it, the burner must always be supplied with "a completely combustible gas and air mixture in substantially unchangeable proportions."

Their proposal is for the pilot-flame to be dispensed with, and instead of it unequal amounts of a completely combustible gas mixture are supplied to the burner, so that at times a large flame is produced (putting the incandescent body into incandescence), and at other times a small flame is produced which is not able to make the incandescent body glow. Thus as a flame is always burning there is no possibility of an explosion each time the incandescent body is made to glow, and therefore the body will have a longer life than when a pilot-flame is employed.

Two arrangements embodying the invention are given; also a plan of the flash-light apparatus.

In the first the flash-light apparatus comprises an automatically working valve, which at certain intervals of time opens and shuts a conduit A leading to the incandescent burner. B is the pipe through which a completely combustible gas and air mixture is admitted to the flash-light. C is a conduit between the supply pipe and the burner conduit, constituting a bye-pass around the flash-light and supplying a smaller amount of gas mixture to the burner when the flash-light valve closes the supply to the burner conduit. When the valve again opens the burner conduit, a larger amount of gas mixture is supplied to the burner, whereby the small flame, which at other times is burning, swells out to a full flame. In the burner, therefore, according to the circumstances, burns a small flame or a full flame, making the incandescent body to glow.



A Swedish Flash-Light Apparatus.

The desired smaller amount of gas mixture may be admitted to the burner when the incandescent body is not glowing, by so arranging the valve D of the flash-light apparatus as not to close the burner conduit completely, but allow a certain amount of gas mixture to leak through the valve, or the gas mixture may be led through a bye-pass E around the valve D.

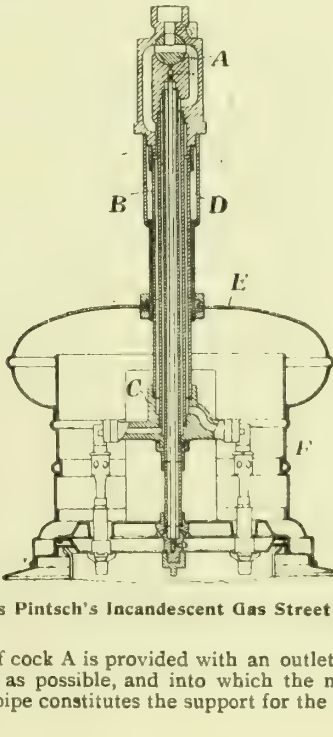
In the second construction, the smaller amount of gas mixture is supplied to the burner from a receiver F, which, by means of the conduit C, is connected with the burner conduit A. Gas is here led to the flash-light apparatus through the pipe B, and air for establishing complete combustion is supplied to the burner conduit through an opening G. The receiver F is closed by a diaphragm H, and the gas and air mixture is supplied to it from the burner conduit through the pipe C during the time the flash-light supplies gas to the burner-pipe A. When the flash-light apparatus closes the gas supply, a smaller amount of gas and air mixture flows to the burner from the receiver F through the conduit C, so that the full flame previously burning is diminished, and the incandescent body ceases to glow. A suction or non-return valve I in the burner conduit prevents the gas and air mixture from flowing out through the opening G.

Hoods of Inverted Incandescent Gas-Lamps.

Julius Pintsch Aktiengesellschaft, of Berlin.

No. 13,130; May 28, 1914. Convention date, June 6, 1913.

This invention relates to outside gas-lamps having a pilot burner, the supply tube of which is placed concentrically within the main gas supply pipe and a movable hood or cover provided with a pipe or tube sliding over the main gas supply pipe and within a tube mounted on the gas cut-off cock; and it consists in the combination with such a gas-lamp of several auxiliary pipes—such as pipes for feeding a flash-light and a night-flame or the like—all branching off from the gas cut-off cock and mounted concentrically within one another.



Julius Pintsch's Incandescent Gas Street Lamp.

The gas cut-off cock A is provided with an outlet at its lower end, which is as large as possible, and into which the main gas-pipe B is screwed. This pipe constitutes the support for the main parts of the lamp and also a rigid connecting member between the cock and the gas distributing member C. A shoulder is provided at the lower part of the cock to which a pipe D is attached. The protecting hood E (which is provided with a tube which is dimensioned so as to telescope conveniently into the tube D) is rigidly attached to the lower cylindrical part of the outer lamp casing F, and, together with this lower extension, constitutes the whole hood or cover, which may be raised and lowered by sliding the tubes telescopically into and out of one another.

All the pipes branching off from the cock—that is, the pipes for the pilot flame and for feeding the various flames, such as the evening and night flames—are arranged within one another and inside the pipe D.

Production of Light Oils from Carbonaceous Substances.

Rollason, A., of Long Eaton.

No. 18,490; Aug. 10, 1914.

This invention is a modification of patent No. 19,697 of 1913, which related to a process for producing light hydrocarbon oils from coals, shales, and the like which are high in volatile matter and have a high oxygen content. The process was carried on at a temperature below 500° C., with approximately between 3 and 5 per cent. of limestone added to the charge in proportion to the oxygen content, "for the special object of limiting the formation of water vapour and increasing the hydrocarbon vapours evolved with the gases during carbonization of the charge—the fixed liquid products being recovered from the gases according to their boiling points."

The present invention relates to the distillation, at low temperatures, of carbonaceous substances—such as coal, cannel coal shale, and crude oils. It consists in their distillation in such a manner that, on the decomposition of the resinous matters contained therein, and during the period of distillation, condensable hydrocarbon vapours are formed, along with sufficient water vapour to prevent these hydrocarbon vapours from becoming overheated and converted into permanent gases or tar, "whereby an increased yield of light oils, of an improved quality, is obtained."

In carrying out the invention, the retort used may be of any approved type, preferably constructed of cast iron. [No illustration accompanies the specification.] The carbonizing space in the retort may be of any desired length or height; the width, in the case of retorts heated from two sides, varying from 3 to 6 inches, according to the density and conductivity for heat of the charge to be distilled.

The retorts are set in brickwork and arranged in such a manner that the materials used for their settings can take up a large amount of heat, and give it out, when required, to the retort during the distillation of the charge. The retort is preferably heated by gas, and so constructed that its temperature can be raised or lowered as desired.

The coal, &c., to be distilled, is crushed preferably below ½ inch diameter; and to the crushed coal or crude oil is added a small percentage of limestone—varying from 4 to 6 per cent. according to the density of the oils required to be produced, which range from ·9 to ·98. The charge while in the retort is heated up to a temperature of approximately 400° C., or it may be maintained at temperatures between 175° and 400° C., according to the density of the oils required to be produced.

The limestone added to the charge takes up heat at a low temperature during distillation and becomes slowly decomposed—liberating carbon dioxide, and leaving the calcium oxide in a nascent state. This now becomes chemically active and decomposes the organic matters and bases contained in the coal—thus liberating the gases which form water and hydrocarbon vapours. At this period an additional supply of heat is required, which is supplied from the brickwork settings; and this heat is utilized to supply the heat of formation of the hydrocarbon vapours formed from the decomposing matter and to raise the temperature of the water produced. The water vapour acts as a carrier for the volatile hydrocarbons, and as a preventative against their taking up heat and being decomposed into gases. The vapours after leaving the retort are condensed—"producing water and a large volume of crude light oils, free from tar, acids, or other objectionable compounds."

The crude oil is re-distilled; the vapours given off being conducted through a reheater and condensed under pressure into oils suitable for fuel and other purposes.

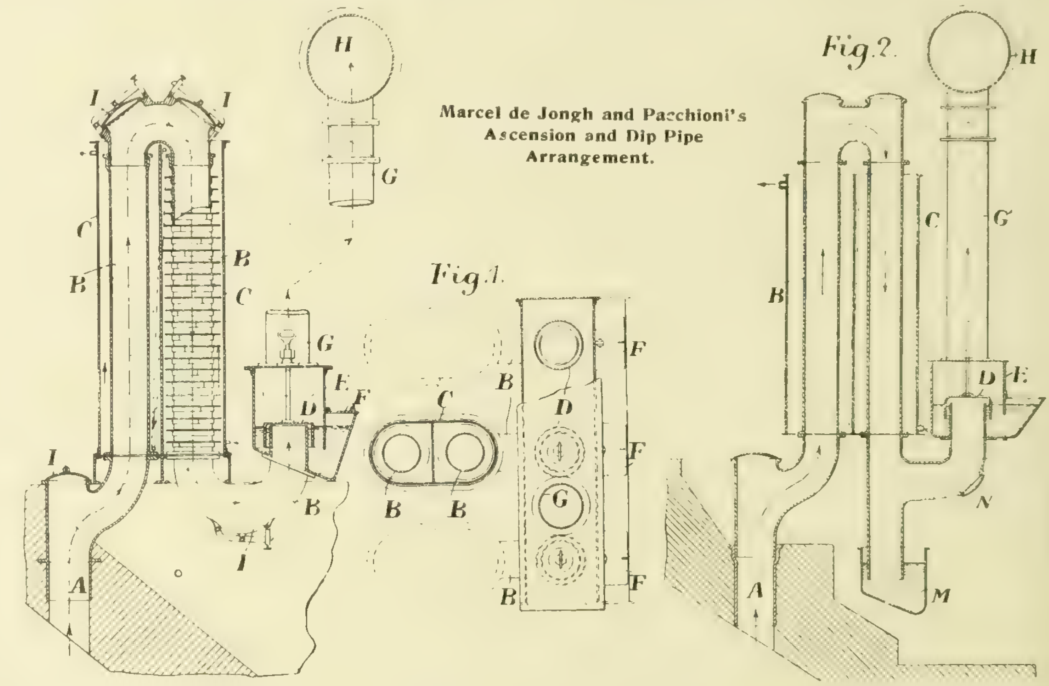
The patentee says he is aware that it has hitherto been proposed to obtain light oils from crude oils by passing the crude oil with steam over marble or equivalent material at a temperature (preferably) between 420° and 460° Fahr.; and he lays no claim to such a process in connection with his invention. What he claims as his invention is: "In the production of light oils, having densities between ·90 and ·98, from carbonaceous substances—such as coal, cannel, coal shale, and crude oils—introducing into the charge before distillation, approximately from 4 to 6 per cent. of limestone, proportionate to the maximum density of the oil required to be produced, and distilling the charge slowly at a low temperature below 400° C.; the charge also absorbing heat from the walls of the furnace during the period of distillation when water vapour and hydrocarbon vapours are formed—the water vapour acting as a carrier for the hydrocarbon vapours and preventing their decomposition into permanent gases and tar while in the retort."

Cooling Device for Ascension and Dip Pipes.

Kilburn, B. E. D.; a communication from Marcel de Jongh, the President of the Società Anglo-Romana per l'Illuminazione di Roma, and Alberto Pacchioni, of Rome.

No. 20,276; Sept. 28, 1914.

This invention has particular reference to installations in which the gas, on its way from the ascension pipe to the hydraulic main or tar-receiver, passes through a pipe, cooled by a water-jacket, furnished with removable covers to allow of access for cleaning purposes. According to the invention, between the upper end of each rising pipe and the tar-receiver, a U-shaped gas-passage pipe is provided, the two limbs of which are separated by a partition and are enclosed in a jacket through which the cooling water is circulated. The limbs are rendered accessible at their upper as well as their lower ends by means of removable cleaning covers, so that although efficient cooling, and consequently thorough separation, of the tarry ingredients of the gas is ensured, owing to the comparatively long path which the gas has to travel, each portion of the jacketed gas passage pipe can be easily inspected and, if necessary, cleaned. The gas outlet pipe, whatever its shape and length, is connected to the corresponding hydraulic valve. All the valves of each furnace (with any number of chambers, each with a valve of its own) are mounted in a joint tank (tar-condenser) provided with lateral cleaning openings, and connected by a pipe and valve to the gas-collecting conduit.


Marcel de Jongh and Pacchioni's Ascension and Dip Pipe Arrangement.

The construction illustrated is claimed to enable the following objects to be attained in a simple and efficient manner:—

1.—Strong cooling of the gas at the escape from the distilling or gasifying chamber.
2.—Separation of the thick tar from the dust and other particles mechanically carried away by the gas.
3.—Complete independence of one furnace chamber from the other chambers of the same furnace during the processes taking place in the chamber—emptying, loading, removal of slag, repairing, &c.
4.—Possibility of carrying out the distillation with a perfectly reliable and easily observed hydraulic seal.
5.—Perfect accessibility of the parts through which the gas passes before entering the gas-collecting conduit.
6.—Complete avoidance of any possible circulation of gas between the rising pipes and the distilling chamber.

In fig. 1 (a section and horizontal cross section of the plant), A is the single gas outlet of the distilling chamber, which forms the inlet into the cooling pipe B. C is the casing provided with cooling water supply and discharge devices and containing the cooling pipe, which may be furnished on the outside with ribs. D is the bell of the hydraulic valve; and E is the tank of the hydraulic valves with the cleaning boxes F. G is the connection pipe to the gas-collecting conduit H; and I are the cleaning covers of the pipes.

As the descending portion of the cooling pipe need, as a rule, be cleaned only at long time intervals, it is possible, the patentees remark, to adopt the arrangement shown in fig. 2, which consists in the cooling pipe being connected to the hydraulic valve by means of a T-pipe, instead of a 180° bend. In this way, any slight deposits falling down during the cleaning of the upper connecting pipe bend, or accumulating in the upper portion of the second (descending or dip) pipe, will fall direct into the tar-vessel M. On the bend N of the T-pipe could be arranged a small door, in order to inspect from time to time the interior. Similar doors are also provided at the upper portion of the cooling pipe.

SOME COMMERCIAL ASPECTS OF THE GAS BUSINESS.

The American Commercial Gas Association's Contribution to the San Francisco Gas Congress.

The programme of proceedings at the approaching San Francisco Congress of the American Gas Institute contains a "Symposium of Some Commercial Aspects of the Gas Business," contributed by members of the National Commercial Gas Association. As it is not likely that we shall have an opportunity later on of dealing with all the papers referred to, it may be well to reproduce some, at all events, of the abstracts as issued to the members of the Association in the current month's "Bulletin."

Orders and Complaints.

By W. J. Clark, of Mount Vernon, N.Y.

Past-President of the National Commercial Gas Association.

The dominant factor in the development of our business, the author asserts, is what we call "good service." The question, therefore, as far as this paper is concerned, resolves itself into what constitutes good service in the operation of the order and complaint department, which in a gas company's organization comes most frequently into direct contact with the public, either in person or through the medium of the mail or telephone.

The man who represents the gas company at the complaint and order desk should be intelligent, well versed in the company's business, and of good appearance. He should be a man of experience, one who has a broad knowledge of human nature, and the ability to size-up other men. He should remember that in most cases he represents to the consumer the company itself, never for a moment forgetting the responsibility this entails.

From the point of view of the front-desk man in the company's office, there should be no such thing as an unreasonable complaint; for to the consumer the complaint is not unreasonable or he would not take the trouble to make it, and the order-desk man must learn to acquire the consumer's point of view. The consumer should not be permitted to believe that the company regards the matter as a complaint at all, but rather he should be made to feel that the gas company is obligated for the favour conferred upon it in having been given an opportunity to improve the "service."

There are other sources through which complaints may reach the company besides the personal interview at the office. Complaints that arrive by mail should be immediately acknowledged and passed over at once to the proper department for attention, and should be carefully and systematically followed up until the consumer has been entirely satisfied. Complaints by telephone should receive the same prompt and intelligent attention that is given to complaints by personal interview. It should always be borne in mind that the listener has only the tones uttered and the voice as it is conveyed along the wire, from which to form an opinion; and there is absent from the telephone conversation the gestures, facial expression, and the personality of the speaker—all of which weigh so much in a face-to-face talk.

Many consumers send complaints through the medium of other of the company's employees—collectors, fitters, &c. The belated delivery of these complaints, even if they receive immediate attention at the office, creates a bad impression of the company in the minds of the consumers. To encourage the prompt reporting of complaints, employees should be furnished with forms on which to report them; and the heads of the various departments whose men rub elbows with the public should ask for these forms each day.

The front-desk man should be on good terms with the heads of all the departments, in order to secure the best co-operation; and he should understand all about the operations of the shop, that he may be able to judge the sort of attention an order will receive, and form some idea as to the time that will be required to make the installation or perform what work is called for by the order. It is recommended that a working schedule, where practical, should be laid out and a copy of it kept within reach of the complaint or order-desk man, by which he can tell approximately when orders of certain classes can be reasonably expected to be completed.

Commercial Lighting.

By E. M. Colquhoun, of Philadelphia, Pa.

Member of the National Commercial Gas Association.

In the past gas has, it is pointed out, successfully met the competition of electricity, largely through its economy; but the old advantage of economy in operating costs that was formerly so beneficial to the gas industry does not exist to the same extent to-day.

Attention is called to the fact that, in addition to the increase in the efficiency of electric lamps, the cost of electricity for store lighting has been decreased in most cities by the adoption of the "demand system" of electric rates; and the comparative cost of gas and electricity for lighting is so much closer to-day than it has been in the past, that it is essential that more careful study be given to the details of the cost of operation for different classes of stores, if plans are to be devised that will successfully meet competition.

To increase the use of gas for commercial lighting, the cost of operation must be reduced. A more economical method of ignition is needed. The pilot consumption of the average store using the latest types of gas arc lamps is one-fourth of the total consumption. With some other reliable ignition system, the elimination of the pilot would give gas a tremendous lead in economy of operation over all competitors.

In the retention of the present gas lighting business, efficient maintenance service continues to be a dominant factor; and too much attention cannot be given to this subject by gas companies, both from the standpoint of improving the service and reducing the consumer's cost to the minimum. The service must be the best and the cost to the consumer as low as possible.

Industrial Fuel.

By F. W. Frueauff.

Past-President of the National Commercial Gas Association.

We all are vitally interested, the author writes, in the development of the industrial fuel branch of the gas industry, because of the very profitable return now received, as well as the great possibilities offered by this field for large increase in the future. Industrial work was begun less than twenty years ago; and a very creditable success has already been attained in marketing this product in industries. Gas men are only beginning to realize the vastness of the field, and are slowly appreciating how unprepared they are to thoroughly invade it. Millions of dollars are spent each year for fuel oil that could easily be added to the gas companies' receipts if a few obstacles can be overcome.

The importance of having rates for large consumptions commensurate with these business opportunities is dwelt upon, because, without adequate wholesale rates, this business is practically excluded from our ledgers.

It is suggested that considerable thought be given to the proposition of manufacturing a gas of lower heat value, which can be produced and distributed at a less cost per unit of heat value than is now customary.

Attention is called to the unfortunate shortage of well-trained industrial salesmen. This condition is, no doubt, due to the failure of many gas companies to understand the real value of such men to their organization; and the positions have not been sufficiently remunerative to induce the proper men to enter this work.

One other rather serious drawback is explained—namely, the slowness in the development of highly efficient large appliances. This is attributed to the unusual expenses incident to perfecting large appliances—an expense the builders cannot entirely shoulder, because of the variety of these appliances needed.

It is suggested that a central development bureau be formed and supported by gas companies wherein large appliances, embodying new ideas of construction and methods of utilizing heats, can be perfected, in order that higher thermal efficiencies can be secured. This bureau would also solve some of the complex problems that will continue to arise as large fuel propositions are approached. The results of the bureau's work would be available to all companies contributing to its support.

The author, therefore, makes the following suggestions to the Congress, the carrying out of which is absolutely essential for the gas industry to reach its highest aims:

First. Lower rates for large consumption, and, if possible from a public policy standpoint, the producing of a gas that can be made and distributed at a much less cost than that now supplied.

Second. More thoroughly trained men, who receive a remuneration in keeping with the knowledge required and the results secured.

Third. The establishing of a central developing bureau to assist all companies in solving difficult propositions so that large consumptions can be taken on.

Commercial Policies.

By C. W. Hare.

The gas industry has ever been slow, the author points out, to realize the importance of the commercial side of its business; and it is due largely to the attitude of gas companies in the past towards the public that unusually intensive methods for promoting the sale of its product are necessary to-day. While the price of gas has been gradually reduced—sometimes voluntarily by the company, sometimes arbitrarily by city authorities—and while regulation by State Commissions, with authority to investigate and fix rates promising reasonable returns on capital has been a great step forward, it should be the policy of gas companies to make voluntary reductions in the price of gas when possible—thus avoiding a petition to the Commission by dissatisfied consumers. Only when it can be demonstrated that the price of gas cannot be reduced an additional cent with justice to the industry, should litigation be resorted to, and the fight made to the finish.

There is not an industry to-day which does as much free work for its customers as the gas industry; and the author sees, at no distant date, the time when the price of gas will be lowered to such an extent that some of the service, which has hitherto been rendered free of charge, must be paid for.

The majority of gas companies of the present day are as liberal in the extension of credit to their consumers, in the sale of gas and appliances, as any other up-to-date retail mercantile store. The offices are attractive and conveniently located, the advertising follows the best traditions of other retail establishments, and the best known methods are adopted to bring gas constantly to the favourable attention of the public.

To individual effort, however, should be added national effort, and this national affort can only be secured through a clear understanding that, unless the gas industry expends a portion of its energy for the good of the industry as a whole, it can never expect to gain to the fullest extent the benefit in its own community which it might otherwise gain.

It is not sufficient to feel that the work one is doing to-day is all that is necessary for the moment, without also considering what may be necessary a few years hence. Take time by the forelock; and if it seems essential that a new policy be formulated a few years hence to meet the then conditions, formulate it to-day. Do not pass on to your successors the burden of meeting conditions which it is your business to foresee and avoid.

Residence Lighting.

By W. A. Morris, of Wilmington, Del.

Commercial Manager of the Wilmington Gas Company.

Residence lighting is considered from the following five separate considerations:

1. The profitability of domestic gas lighting.
2. The advantage of domestic gas lighting over other illuminants and how best can the public be brought to appreciate the superiority of gas lighting.
3. What constitutes satisfactory domestic lighting for the various rooms of the average residence and what units are available?
4. The best practices for merchandizing this branch of our commodity.
5. Retaining residence lighting.

First: It is conservatively estimated that 2000 cubic feet *per capita* is a fair basis to estimate the possible revenue from the domestic lighting branch of the industry. It is shown that domestic lighting is now receiving greater competition than domestic fuel; and as the loss of business would not reduce the fixed charges, they should be entirely eliminated, or nearly so, from the consideration of profit in this branch of our industry.

Second: Dependability, economy, quality, and aid to ventilation are the advantages of gas lighting over other illuminants. Eminent authorities are quoted as substantiating this claim. A suggestion is made that these advantages be more widely proclaimed by local and national publicity, so that the public will become more thoroughly convinced.

Third: The following table gives a minimum amount of illumination required for the various rooms of the average residence. There are a number of available units which fill the requirements in the various rooms, the selection of which is largely a matter of taste.

Minimum.

	Total Candle Power of Lamp.		
Size of Room.	Small.	Average.	Large.
Parlour	80	80	100
Dining room	80	100	120
Kitchen	60	80	100
Pantry	40	40	40
Living room	100	150	200
Reception hall	40	40	40
Porch	40	40	40
Music room	100	120	140
Library	80	120	160
Sewing room	40	80	100
Bed-room	60	100	140
Bath-room	40	80	80

This table is for light walls and ceilings, and direct lighting with fairly good reflectors of the usual residence type. For dark walls, increase specifications 25 per cent. For semi-indirect lighting, which, of course, requires light ceilings, double the figures given for direct lighting.

Fourth: More elaborate displays of modern lighting fixtures are urged for gas companies and more concerted efforts to encourage the manufacturers of higher-grade fixtures and more efficient burners. It is shown that liberal advertising policy has been a success in convincing the public that modern gas fixtures can be obtained as ornate as electric fixtures.

Fifth: It is claimed that the success of any enterprise depends largely on the satisfaction that its customers receive; and the only means of customers receiving continuous satisfaction is by a system of maintenance of residence lighting by the various companies. The modern gas-burners are somewhat complicated, and subject in recent years to numerous improvements; and the public cannot be expected to trace their troubles to improper burner regulations and know just what to do to remedy them. They therefore often find fault with the quality of the gas, or condemn modern gas lighting as impracticable, which condition can only be eliminated by well-organized and systematic maintenance.

In conclusion, the following paragraph touches on the duty to the industry and to the public: "It must not be forgotten that we are entrusted with the future welfare of a commodity that is of great benefit to the public; and unless we use every effort to further the sale of gas for all its purposes, and acquaint the public with all its advantages, we are not fulfilling our duty to the gas industry and the general public."

Domestic Lighting.

By J. D. Shattuck, of Philadelphia, Pa.

The subject of domestic lighting in its relation to the gas industry is one of the most interesting as well as one of the most important problems of the present time; for it is a branch of the business which represents a large proportion of the gas sold in the United States, and is the most stable department of the gas business, in that it is least affected by depressed business conditions.

The installation of mantle burners only marks the beginning of the supplying of light in the most usable and advantageous way, for improved lighting may necessitate better and more attractive fixtures just as well as the more efficient production of light.

Following this must come a broad maintenance service. To secure the best maintenance results, one must get in touch with the burner itself—resulting in direct contact with the consumer. Every company should adopt a maintenance system which to the individual company will accomplish the most good for its particular requirements. The development period of this system will undoubtedly show a loss; but this is true of almost any business undertaking. Maintenance service, if properly organized, and systematically operated with a definite purpose in view, can be counted on to produce a return equivalent to, or greater than, the return on the same amount of money spent in advertising the subject and asking consumers to "tell us if their lights are not in condition."

Good lighting is a necessity in every home, and a necessity always finds a market. With this in mind let us, the author writes, go out with the determination to improve every lighting installation. This improvement will keep us in the lead in the artificial lighting business. It will reduce our worries and increase our sales. The American people of to-day desire results, and we can give them results.

Domestic Fuel.

By R. E. Slade, of Providence, R.I.

Past-President of the National Commercial Gas Association.

Domestic fuel appliances for the purpose of cooking are held by the author to be of the first importance to gas companies; and it is largely with these appliances that increases in gas sales have been secured. The manufacturers have brought out a great number of designs, so that there is a type of range adaptable to any kitchen.

While originally gas-cooking appliances were used only during the summer months, their use is being extended more and more throughout the year; and it will be largely through the greater use of gas-ranges in the winter months that increases in gas sales will be secured in the future. The only obstacle to their continued use during twelve months of the year has been that they do not heat the kitchen nor supply hot water. In the newer houses, this difficulty has been overcome by making provision to heat the kitchen from the central heating plant, and, by the installation of a coil in the furnace, hot water is secured at a minimum expense for household use during the winter months. In the summer, the gas water-heater forms an economical means of securing hot water. In a great many of the older houses, the existing heating plants are so small that they cannot stand the additional work of heating the kitchen and supplying hot water in winter; but, as the small furnaces wear out, it is to the interest of gas companies to encourage the installation of larger heating plants, for through this it will be possible to make the gas-range the standard cooking appliance throughout the year. Attention is called to the importance of the gas water-heater as a means of increasing gas sales, and to the fact that it seldom requires an additional expenditure for mains, services, or meters.

There should be increased activities in the sale of gas for heating purposes. While the exclusive use of gas for heating is only urged in localities where the cold season is very short or cold days occasional, they are extremely useful elsewhere as auxiliary sources of heat for the period before and after the season when the coal or coke heating plant is in use. In sections where the cold season is short, and the heating load added to the peak, it would be well to consider whether the amount of gas sold for this purpose carried profit enough to pay the fixed charges on the apparatus necessary to care for this peak, which is idle during the balance of the year.

Miscellaneous gas appliances have their special uses; and for any domestic purpose where fuel is required, there is a gas appliance capable of doing the work. Attention is called particularly to the garbage incinerator which is rapidly being developed, and to the gas-iron which has been perfected to a high degree within the past few years. While the gas consumption of irons is comparatively small, there is an indirect return from their installation, because they render unnecessary the retention of the coal-range for ironing day—resulting in increased use of the gas-range and water-heater.

Office Management.

By C. N. Stannard, of Denver, Colorado.

Past-President of the National Commercial Gas Association.

In general business, the office is the place for originating orders, receiving information, classifying and distributing it, and digesting the reports received from the various departments. If an efficient office is desired, one must have an efficient office manager; and a man to fill this position must be one of great tact, an organizer, and, above all, one with a naturally systematic mind.

In addition to an able manager, charts of the organization will prove invaluable in the saving of time and promoting smoothness of operation in the various departments. These charts should show the relation of the various departments to each other, the duties of each department, names of heads of departments, and other information—in fact, a graphic representation of the organization. These charts should be hung in convenient locations, and should be clearly understood by the employees.

Attention is called to the necessity of having an efficient means of internal communication in an office of any size. Such a system should encourage written communication from one member of a department to another because: First, written communications can be sent more quickly than the person to whom it is sent can be found and given verbal instructions; and, second, the written communications can be referred to at any time, and they prevent misunderstanding of instructions.

The arrangement of an office is an important feature. The application desk, cashier's desk, and other points for the public should be so located that the various displays must be passed in order to reach them. The display room is so important that the gas company should do, as merchants do in other lines of business, everything possible to attract the public to their stores. Special demonstrations are recommended for this purpose, as well as attractive window displays.

Discipline is one of the important factors in the control of an office; but it is of such a delicate and intangible nature that it is impossible to secure it by printed rules. Straight-from-the-shoulder talks are the best means to secure proper discipline; and the unruly members of a department who will not heed such talks must be replaced.

Standard forms should be used in an office wherever possible, for they minimize office labour, and it has been found by tests that clerks will do 50 per cent. more work on standard forms than without them.

Public Relations.

By Edgar N. Wrightington, of Boston, Mass.

Past-President of the National Commercial Gas Association.

It is only by active and aggressive methods of solicitation of business, combined with a sincere effort to perfect the service and give the customer the most for his money, that the fullest returns to the business can, according to the author, be secured. Once the gas manager has convinced himself of the advantages of such business methods, it becomes necessary to transform the traditional feelings of the customer also. The way to do this is to make every customer feel that his patronage, however small, is of the utmost concern to the company.

If a complaint is made regarding any part of the service, the greatest deference should be shown to the point of view of the customer, and the utmost endeavour should be made to satisfy him. Unfortunately, the majority of the complaints are made regarding the size of the customers' bills, and in these cases the greatest tact is needed to prevent the customer getting the impression that the company has assumed an arbitrary and unreasonable attitude in refusing to give a rebate on the bill unless an error has been proved. A careful investigation by a competent inspector is advisable where complaints of high bills are received.

The maintenance of consumers' appliances is another factor in developing the "satisfied customer;" and attention is called to the necessity of establishing rates for gas that will permit the gas company to supply not only gas but also good service, which necessarily includes a certain amount of free maintenance of appliances.

The only way to gain the confidence of the public is first of all to merit it by square dealing, and then to take them into our confidence, give full publicity to all our dealings, tell the public how much we earn and how it represents only a fair return on our properties, and wherever there is a dispute over any matter, be as tactful as possible in handling it. This is the way to get that desirable asset—the satisfied customer.

Accounting.

By P. S. Young, of Newark, N.J.

Past-President of the National Commercial Gas Association.

This contribution does not present an outline of accounting procedure or discuss accounting systems, but draws attention to the main functions of accounting—what it has accomplished in the past in the gas business, and what it may reasonably be expected to accomplish in the future; and it includes some suggestions intended to bring about a higher standard of efficiency in the accounting departments of gas companies. It emphasizes the importance of simplicity in accounting, and points out the essential qualities of an efficient system. The development of standardized methods and processes is advocated; and the proper selection and education of the accounting employee is urged.

LABOUR QUESTIONS AT THE BRITISH ASSOCIATION MEETING.

Two subjects—"Outlets for Labour after the War" and "The Relations between Employers and Employees"—of special interest at the present time engaged the attention of Section F (Economic Science) at the recent meeting of the British Association at Manchester.

Section G had a Committee appointed last June to investigate outlets for labour after the war. It consisted of Professor W. R. Scott (Chairman), Messrs. C. W. Bowerman, M.P., W. J. Davis, J.P., J. St. G. Heath, J. H. Seddon, E. D. Simon, Sir H. Rider Haggard, Sir C. P. Lucas, K.C.B., Sir C. W. Macara, Bart., Sir Sydney Olivier, Sir E. im. Thurn, Professor E. C. K. Gonner, and Professor A. W. Kirkaldy (Secretary). The terms of reference were: (1) To investigate into the replacement of men by women in industries during the war; (2) the permanent effects of this after the war; (3) the character and re-employment with respect to changes of taste and physique among those who have served with the forces and are disbanded; (4) to suggest means by which consequent unemployment may be counteracted or minimized; (5) the possibility of employing disbanded men on the land.

It was decided to deal with the first two items only by way of report; and to investigate those industries in which the extra employment of women since the war had been most marked, as well as those industries in which there were possibilities of an extension of women's work, with special reference to trades localized in London, Manchester, Leeds, and Birmingham. For this purpose a number of investigators were appointed, and reports have been issued dealing with a large number of industries.

Among the trades in which the extension of women's employment has been most marked are engineering and chemicals (explosives). It is pointed out that, after the war, this employment will decline in a large measure; and for this reason these industries do not come so much within the category of trades in which there is likely to be any considerable readjustment as between the proportion of male and female labour employed in peace times. Nevertheless there is a marked tendency in these trades for women to undertake, in normal times, work usually associated with men. The whole problem was discussed in all its aspects; and the general report concluded with detailed reports on various trades.

The gas industry, as such, is not classified; but a report dealing with chemicals appears. It states that there has been a steady increase in employment in the chemical trade from the outbreak of war. The number of women in explosives works, which on July, 1914, was about 8000 has considerably increased—being drawn from other branches of the trade wherever work was comparatively slack owing to lack of materials and from depressed trades. The division of male and female labour in the trade seems clearly defined, and there is practically no question of women working on processes previously done by men. In Birmingham much of the more scientific chemical work was carried on for the Government in the laboratories of the Municipal Gas Department. This work has recently been considerably increased, and has been transferred to the Chemical Department of the University of Birmingham. The numbers employed, therefore, have been added to not by the employment of women, but by the employment of lecturers and students of the University not otherwise engaged in the work of production. The employment of University women in the most skilled departments of the trade such as research does not seem as yet to have been considered by employers.

The second subject referred to—the relations between employers and employees—is one which, while more or less normal in England at all times, has been accentuated during the war, not unnaturally called for some attention. While the gas industry, *per se*, has not been an offender, a closely allied industry—viz., the coal miners—has been very much to the front, and it may safely be assumed that, although other industries have added their quota to the worries of Ministers in these troublous times, the coal mining industry has been the chief seat of unrest.

Professor W. R. Scott, in his Presidential Address to Section F, did not touch very deeply upon the problem, but clearly pointed the path of duty for every skilled, and indeed unskilled, man at the present time—viz., to assist, by steady and sustained industry, to help in providing, directly or indirectly, all the supplies which are required. This implies a sinking of our own individual grievances, which after all are trifling compared with the main point at issue.

Professor H. S. Hele-Shaw, in his address to Section G (Engineering), however, went much farther. Having mentioned Field Marshal von Moltke's recent utterance, that Germany's emergence from a dangerous position as regards the supply of munitions was due to Germany's extraordinary organization, which included not merely the adaptation of their factories for munition purposes, but capacity for work of the people and the patriotic spirit of the German workman, he proceeded: This brings me to consider what is probably the most serious feature in our national life to-day—viz., the relation of employer and workman. It is hopeless, as long as such ideas prevail which seem to do at present, to think of any sound organization of our industrial system taking place, because the interdependent parts are not arranged (and can never be arranged until we change radically) with respect to the whole. Now as one who has served an apprenticeship, who has taken his money weekly from a tin box with hundreds of other men, who has been a member of the Amalgamated Society of Engineers (in fact, was working as an engine fitter when a Whitworth scholarship made a college career possible), I am the last man to put this evil down entirely to the working man. I know individually he is just as capable of patriotism as any other class. Get him by himself, even the men whose strikes have caused such despondency in the minds of our Allies, and who have seriously jeopardized the very existence of the country, and you will find (except in the sort of case to be found in all classes of society) that he, as an individual, is willing to make sacrifices, and if necessary to give himself for his country. The truth is that the canker which is eating the heart out of our industrial life is due to an entirely wrong attitude of mind. For instance, however much we may sympathize with men who see a loss of employment in the introduction of labour-saving machines, some means should be found by which they can share the benefits to the State and to their employers by the introduction of such machines. I should like, if I had time, to say something about the marvellous organization of the Ford motor-car works in America, and how it has given the men a share in the returns of a great industry, and thereby induced them to work in a way that has enriched themselves, their employers, and their country. We have many splendid examples of this co-operation in this country. Again, the employment of women in the engineering industries has taken place in many directions owing to the war. The works with which I am associated could not have undertaken much munition work without it. Some steps should be devised by which this avenue of industry is not closed to women after the war, while justice is secured for the men alongside of whom they are working, and from whom they are in many instances learning mechanical skill. Again, the questions of piecework and overtime must be seriously considered by the State, and not allowed to become the subject of disastrous disputes. Once more there is the question of a standard wage. It is against the eternal laws of Nature to try and keep living beings at one dead-level of equality and merit—*i.e.*, it is against the law of the survival of the fittest. The trade unions have a great opportunity of placing their country and themselves in a leading position among nations if they will courageously grapple with a great problem by recognizing degrees of merit and corresponding degrees of payment. These are a few of the many matters which must be dealt with in the immediate future. The matter of labour disputes is so serious as to demand plain speaking. It must be admitted that there are many employers and companies which, to satisfy themselves and their shareholders, extort the largest possible dividends and pay the smallest possible rate of wages, and do so apparently without the slightest idea that the men and boys under them are capable of education and personal influence. Can it be wondered then that men under these conditions are willing enough to listen to the orator who merely appeals to their fighting instincts and join in the game of grab as against the employer. On the other hand, strikes have occurred when employers have honourably carried out their obligations and undertakings, and the men have shamefully departed from an agreement made by their chosen leaders—throwing over the leaders the moment they have fancied it to their own selfish interests to do so, and without a single thought of their duty to the community as a whole. We have recently seen the Prime Minister and other leading statesmen struggling sometimes in vain to bring large bodies of men to a reasonable state of mind. Is not this (and I speak without the slightest reference to party questions) a case of nemesis overtaking us for having in so many cases pandered to the selfish instincts of large bodies of men so as to secure votes, instead of sternly telling them unpalatable truths?

The Economic Science Section also devoted a whole day (less the time necessary for the delivery of the Presidential Address) to the question of industrial harmony. As was perhaps to be expected, it was somewhat unsatisfactory, and petered-out without any resolution being put. This is not, however, intended in any way as disparagement. Exigencies of the times no doubt kept away many who could have spoken on the practical side. Economists, employers, and workmen's representatives took part in the debate; but any attempt to deal with this complicated problem in a comprehensive way must be foredoomed to failure, owing to the varying conditions and necessities of every industry. One new difficulty which some foresee is that the men having become accustomed to the more remunerative war conditions will resent the reversion to the old order after the war is over—advances made now by way of war bonus it will be desired to retain for all time.

SULPHATE OF AMMONIA PRODUCTION IN 1914.

Statistics by the American Coal Products Company.

Inasmuch as the principal European producers are engaged in warfare, it is, for the first time for many years, impossible to discuss the world's production of sulphate of ammonia from a basis of actual figures—statistics for Europe being obtainable to only a limited extent.

With this explanation, the American Coal Products Company, of New York, open their report upon the production of sulphate of ammonia in 1914 [which supplements in some respects Messrs. Bradbury and Hirsch's review of the market which was dealt with in the "JOURNAL" for Jan. 19 last]. They are, however, able to report definite decreases in the year's output of England and the United States, due to the war conditions existing in the last half of 1914; while in Germany it seems almost certain that a probable increase in the first half of the year was more than counterbalanced by a heavier decrease due to disturbed conditions in the last half. The production in Belgium was practically eliminated for the last half of the year, and presumably suffered in France for the same period. On these data, their estimate of the world's output is nothing more than a guess; but it may be hazarded at about 1,300,000 to 1,350,000 metric tons, as against 1,409,000 metric tons in 1913.

As regards the prospects for 1915, the report says it is quite probable that, contrary to expectations, there will be an increase rather than a further decrease. Modern explosives require the production of benzol, toluol, and ammonia; and these demands have brought the corresponding branches of bye-product recovery into strong favour. For this reason, existing plants will be operated at full capacity wherever possible; and the replacement of beehive by recovery coke-ovens has been to some degree encouraged. The demand for war munitions has reacted on the steel industry, both directly and indirectly; and there has been an increase in production, which brings with it an increase in coke and ammonia. This is true of the United States and of England; and in Germany it is reinforced by the need of benzol as a motor fuel and of sulphate of ammonia as a fertilizer—the latter to replace the nitrate of soda hitherto imported. With the prospect that business will be good until the close of the war, and possibly longer, it seems not unreasonable to expect that the ammonia production will increase correspondingly.

SOURCES OF PRODUCTION.

The bye-product coke-oven, the report goes on to say, still continues to be the main source of ammonia recovery, and the one that promises the most extension in the immediate future. Coal-gas works stand next in total output, though much greater in number, and more widely distributed geographically. The bye-product recovery gas-producer, the shale oil distillation process, and the English blast-furnaces using splint coal, are also responsible for a certain amount annually. Some is obtained from the carbonization of bones, and from peat—there being two Italian plants reported as operating on this material.

The methods by which atmospheric nitrogen is transformed into ammonia—viz., the synthetic process of Haber and La Rossignol—and the manufacture of calcium cyanamide, afterwards treated to liberate ammonia, appear to have been extensively pursued in Germany, because of the needs of war and agriculture. So far the Haber process has not been introduced elsewhere; but the production of ammonia from cyanamide has been carried on in Germany and Italy, and to a limited extent elsewhere. It is both interesting and significant to note in this connection that a Bill has recently been introduced in the German Federal Council to create a nitrogen monopoly in Germany extending to 1922.

Commercially, the season of 1914-15 was one of hope deferred rather than of fulfilment. The unfavourable prospects at the close of 1913 were adequately realized in a market that sagged continually throughout the first half of 1914. Towards the close of the year, however, more favourable conditions began to prevail, and prices had an upward tendency; but the monthly English quotations have averaged from £1 5s. to £2 10s. below those of the previous year; and the average for the year is £2 lower.

PRODUCTION OF THE UNITED KINGDOM.

The production of sulphate of ammonia and its equivalent in the United Kingdom, as reported by the British Alkali Committee, amounted to 426,412 gross tons; there being therefore a shortage of 6200 tons compared with the output in 1913. The cause of this reduction is, of course, the war. Examination of the separate items shows that the gas-works have lost most heavily, the iron-works quite considerably, and the shale-works a small amount. Part of these losses was neutralized by a substantial gain in the bye-product coke-ovens and a slight one in the producer and carbonizing works. The consumption of ammonia in all forms, reckoned as sulphate, is estimated at 106,000 tons in 1914—an increase of 9000 tons over 1913. The average price of the 24 per cent. grade at Hull for the year 1914 was £11 7s. 1d., as compared with £13 7s. 8d. for the year 1913. The English exports in 1914 were 313,877 tons, or nearly 12,000 tons less than in 1913, which, in the circumstances, is not surprising.

THE GERMAN OUTPUT.

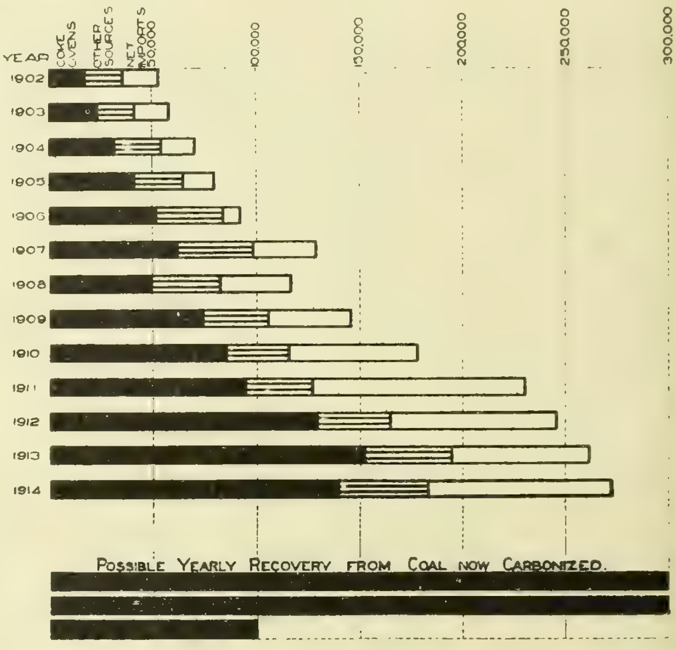
There are no figures at hand to indicate whether or not the German output of 548,560 tons in 1913 was exceeded in 1914. So far as can be judged by trade conditions, there was an increase in the production during the first half of the year, though the demand for coke was not really active.

The annual report of the Deutsche Ammoniak-Verkaufs-Vereinigung states that the beginning of 1914 did not reveal favourable conditions for the disposal of sulphate of ammonia. In spite of the reduction in price made toward the end of 1913, a large quantity still remained unsold at the end of the shipping season—*i.e.*, the spring of 1914. In the foreign market English competition made itself strongly felt. In addition to this, other nitrogen carriers were freely offered. Though early in 1914 Japan and especially America unexpectedly made their appearance as buyers of respectable amounts for spring delivery, the market was not steadied. The supply was in excess of the demand. Under these influences, the English quotation fell continuously from M.24·35 per 100 kilos. at the beginning of January to M. 20·35 at the end of May. During this time, exports amounted to 67,000 tons, as against about 38,000 tons for the same period of 1913. The outbreak of war at the beginning of August did not notably affect the market. Uncertainty prevailed; and it seemed probable the lack of skilled labour would prevent the saving of the partially gathered harvest, as well as hinder adequate and timely planting in the spring. Doubt as to the progress of the war paralyzed action. In Germany, this feeling soon gave place to confidence; and careful examination of the new conditions brought the conclusion that, with the restriction in the imports of Chilian and Norwegian nitrates, there would soon be a scarcity of nitrogen in Germany. The inquiry for sulphate of ammonia became active, and offerings were not adequate. The middleman's prices rose to such an extent that the Government intervened, and, with the co-operation of those concerned, established maximum prices. In consideration of the fact that the war made a reduction of price unnecessary, and further that the manufacturing costs had been increased, the Vereinigung were able to make arrangements with many of their customers to cancel the price reduction agreed upon. For this reason, the reduction was but little felt. At the end of September, the Government of Germany prohibited the exportation of nitrogen. Previous to this circumstance, the export business in 1914 had been steadily increasing.

The total disposed of for the year by the Vereinigung was 413,837 tons, as against 335,232 tons in 1913. On Dec. 14, 1914, the official maximum price for sulphate was fixed at M. 27 per 100 kilos. for 25 per cent. grade, and M. 27·50 for the dried and ground, analyzing 25·5 per cent. ammonia in quantities of 5 tons or over, including freight to districts adjoining and west of the Elbe, excluding cost of sacks. On June 1, 1915, these prices were advanced to M. 30·50 for the 25 per cent., and M. 31 for the 25·5 per cent. According to the official returns, Germany exported 75,868 metric tons of sulphate of ammonia in 1914, and imported 34,628 metric tons.

THE UNITED STATES.

The production of the United States in 1914 was only 183,000 net tons of sulphate and its equivalent—less by 12,000 tons than in the year before. This reduction came mostly in the last half of the year, and was due to the influence of the European war on the iron and steel trade. Had business kept the pace of the first six months, there would have probably been a small increase over 1913, in place of a deficit. Of the 183,000 tons produced, 139,500, or 76 per cent., are chargeable to the bye-product coke-ovens, and the balance to coal-gas works, bone carbonization, and other sources.



UNITED STATES PRODUCTION, NET IMPORTS AND CONSUMPTION OF SULPHATE OF AMMONIA AND SULPHATE EQUIVALENT,

Together with estimate of the amount recoverable annually from the coal now made into coke. Net ton = 2000 lbs.

The addition to the bye-product coke-ovens for the year 1914 included 41 Semet-Solvay ovens at Indianapolis, 27 Gas Machinery Company's ovens at Johnstown, 120 Koppers ovens at Sparrows Point, and 18 Wilputte ovens at Joliet. Besides these, 224 Koppers ovens at the Bethlehem Steel Works and 56 for the Laclede Gas Company at St. Louis went into operation—the former early in 1915. Construction of 100 Otto ovens at Buffalo is held up by the war. An addition of 20 ovens to the Inland Steel Company's plant at Indiana Harbour, went in during January, 1915. New plants expected to come into operation during 1915 include the Chattanooga Gas and Coal Products Company, 12 Roberts ovens; the Youngstown Sheet and Tube Company, 204 Koppers ovens; and the Minnesota Steel Company, 90 Koppers ovens. Additions comprise 92 Koppers ovens to the Republic Iron and Steel Company's plant, and a reconstruction of 120 ovens for the Allegheny Bye-Product Coke Company.

The consumption in the United States amounted to 272,000 tons, in round figures, as against 262,000 tons in 1913, an increase of 10,000 tons, showing that consumption progressed, even if production halted temporarily. The average price for the year is $54·20 per net ton, less by $8·66 than in 1913, and by $11·37 than in 1912. While the average indicates the condition of the market for the year fairly well, the pendulum has now swung upwards again; and under the influence of the short home supply and the high freights from England, it seems bound for new high levels.

France.

Unfortunately, the figures for the sulphate of ammonia production of France for 1914 are not available, though it is reasonably certain that the total is less than the 74,500 metric tons produced in 1913, because of the general stagnation of industry arising from war conditions. Imports for the calendar year 1914 are officially given as 9274 metric tons, and exports as 2077 metric tons.

Japan.

Japan, as in past years, remains the largest single customer of England, taking 87,776 tons, though not as much as in 1913. The total imported is given by a United States consular report as 117,368 tons for 1914. The figures for production for 1913 and 1914 are not yet available.

Table I.—*World's Sulphate of Ammonia Production.*

(In metric tons of 2204·6 lbs.)

Country.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.
England	294,170	318,400	330,450	354,747	373,590	391,160	394,540	439,565	433,259
Germany	235,000	287,000	313,000	330,000	373,000	418,000	492,000	548,558	..
United States	68,000	90,120	79,500	96,600	105,143	115,245	149,700	176,900	166,016
†France	49,100	52,700	52,600	53,600	56,000	60,000	68,500	74,500	..
†Belgium and Holland	30,000	*55,000	§35,000	§40,000	§43,000	§43,000	§55,800	§53,600	..
†Spain	10,000	‡12,000	..	12,000	9,000	..	§9,000	§15,000	..
†Italy	5,000	11,000	§80,000	12,000	12,000	§166,500	§15,000	§15,000	..
†Other Countries	40,000	65,000	..	§73,000	§79,000	..	¶68,800	¶86,100	..
Total	731,270	891,200	890,550	971,947	1,050,733	1,193,905	1,253,340	1,409,223	

* Including Norway, Sweden, and Denmark. † Estimates from l'Engrais. ‡ Including Portugal. § Estimates from Deutsche Ammoniak-Verkaus Vereinigung, 1907-9 10-11-12-13. ¶ Estimated.

Table II.—*Production of Ammonium Sulphate and Sulphate Equivalent from Bye-Product Coke-Ovens and Gas-Works in Germany.*†

(In metric tons of 2204·6 lbs.)

	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
Coke-ovens	152,000	168,000	..	257,000	..	270,000	313,000	351,000	..	475,558
Gas-works	21,000	22,000	..	*30,000	..	60,000	60,000	67,000	..	73,000
Total	173,000	190,000	*235,000	*287,000	*313,000	*330,000	*373,000	*418,000	*492,000	*548,558

* Deutsche Ammoniak-Verkaufs-Vereinigung, 1906-07-08-09-10-11-12-13. † Dr.N. Caro, Zeit. f. angew. Chem., Sept. 14, 1906.

Table III.—*United States Ammonia Production, Expressed in Sulphate Equivalent.*

(Tons of 2000 lbs.)

	1901.	1902.	1903.	1904.	1905.	1906.	1907.
Bye-product coke-ovens	15,279	18,483	24,098	32,653	41,864	..	62,700
Coal gas and bone carbonizing works	*14,000	*17,641	*17,775	*22,011	23,432	..	36,609
Total	29,279	36,124	41,873	54,664	65,296	*75,000	99,309
Per cent. from coke-ovens	52 p. c.	51 p. c.	57 p. c.	60 p. c.	64 p. c.	..	62 p. c.

	1908.	1909.	‡1910.	1911.	1912.	1913.	1914.
Bye-product coke-ovens	50,073	75,000	86,000	95,000	130,000	153,000	139,500
Coal gas and bone carbonizing works	33,327	*31,500	*30,000	*32,000	35,000	*42,000	*43,500
Total	83,400	106,500	116,500	127,000	165,000	195,000	183,000
Per cent. from coke-ovens	60 p. c.	70 p. c.	74 p. c.	75 p. c.	79 p. c.	78·5 p. c.	76 p. c.

* Estimated.

Table IV.—*Ammonium Sulphate and Sulphate Equivalent Produced in France.*

(Tons of 2204·6 lbs.)

	1909.	1910.	1911.	1912.	1913.
Gas-works, Paris and vicinity	14,000	17,500	19,600	20,600	22,300
Provincial gas-works	4,000				
Bye-product coke-ovens	22,800	26,000	29,000	33,000	37,500
Sewage disposal	11,300	12,200	12,000	12,000	12,200
Shale-works	900	1,600	1,900	2,900	2,500
Various sources	500				
Total	53,500	57,300	62,500	68,500	74,500

The following table gives the estimated quantity of sulphate of ammonia and its equivalent in other forms of ammonia consumed in the countries specified.

Table V.—*Sulphate of Ammonia Consumption.*

	*United Kingdom. Gross Tons.	†Germany. Metric Tons.	‡United States. Net Tons.	¶France. Metric Tons.
1900	65,000	127,700	§36,000	49,000
1901	68,297	168,000	§43,700	43,300
1902	63,750	175,000	§54,300	53,300
1903	71,700	172,500	58,650	53,900
1904	68,500	200,000	71,300	53,800
1905	75,000	213,000	80,600	56,380
1906	82,000	229,500	§84,000	67,000
1907	87,500	240,000	130,000	81,000
1908	90,000	260,000	117,700	84,000
1909	87,000	274,000	§146,700	78,500
1910	87,000	350,000	§178,300	73,000
1911	89,000	370,000	§230,400	84,000
1912	90,000	425,000	§246,100	§91,000
1913	97,000	460,000	§262,000	§95,000
1914	106,000	—	§272,158	—

* Messrs. Bradbury and Hirsch. † 1900-4, Chemische Industrie; 1905-13, The Deutsche Ammoniak-Verkaufs-Vereinigung. ‡ Compiled from statistics issued by United States Government. § Estimated. ¶ L'Engrais.

The report includes a chart showing the fluctuations in prices, over a number of years, of sulphate of ammonia and nitrate of soda and the price per pound of nitrogen in each.

FACTORY AND WORKSHOP LIGHTING.

Appendices to the First Report of the Committee.

Further notes are given now from the appendices which accompanied the first report of the Home Office Departmental Committee on Lighting in Factories and Workshops. Some of the appendices were similarly dealt with last week [p. 596]; while one of the more important from the point of view of readers of the "Journal" will be found reproduced *in extenso* on pp. 643-5 of this issue.

Accidents in Factories.

In a memorandum prepared by the Joint Secretaries of the Committee [Messrs. D. R. Wilson and C. C. Paterson], it is stated that, in order to discover the relationship (if any) between working with artificial light and liability to accident, use was—on the suggestion of Mr. L. W. Thomas, of the Statistical Branch of the Factory Department—made of a special return of all reported accidents for 1913 and part of 1914. In this return the numbers were tabulated, for a large number of industries, of accidents occurring each month from various causes. From this return industries were selected for study, on account of the uniformity of conditions prevailing, special liability to accident, or large size of the industry. In the first place, diagrams were prepared showing monthly percentages of accidents due to the different causes, and for each month the relative number of accidents from these causes. Diagrams based on the first-named plan [which takes no account of the number of working hours or of persons at work each month], indicate a general drop for August, and in many instances a sudden rise in October, for some reason difficult to explain. On the second plan, the effect of the variations in the number of persons working and the number of working days is eliminated; but the true character of the curve may be masked by changes in the number of accidents occurring in the industry from causes other than that under consideration. The diagrams based on the second method possess, generally speaking, no characteristic form, except for accidents due to persons falling. The tendency of these particular curves [apart from building construction and docks] indicates an increase during the winter months of accidents due to this cause. In the general engineering industry, the curve showing accidents due to persons falling indicates a maximum number of accidents from this cause in January and a minimum in May. A curve dealing with all the industries demonstrates that in May 11·5 per cent. of all accidents were due to falls, as compared with 14 per cent. in January.

Another method was also pursued, based on certain assumptions, in which an attempt was made to calculate the normal accident rates from each cause during the months when no artificial light is used, and, by applying these rates to the daylight period of employment during the winter months, to estimate the accident rates during the use of artificial light. The hours adopted are such that for practical purposes no artificial light conditions obtain from April to September inclusive—that is, five months, excluding August, which is ruled-out on account of holidays. The average number of accidents per hour during this period is taken to represent the accident-rate per hour under daylight conditions only. General holidays are allowed for; and it is assumed that artificial light conditions obtain from half an hour before sunset to half an hour after sunrise. For all industries except engineering, the hours of work are taken as ten per day, between 6 a.m. and 5.30 p.m. In the case of engineering, the hours are assumed to be between 7 a.m. to 5.30 p.m., with an average of overtime in 1913 for all workers of one hour a day, from 6 to 7 p.m.

The total number of accidents from all causes from April to September, 1913 [excluding August], was 73,387, or 61·3 per hour; and this, being the normal accident rate under daylight conditions, is the rate assumed to hold good during daylight hours in the winter months. In this way it is possible to deduce for each industry the accident rate during the hours of artificial light which obtain in the six winter months. The total number of accidents in this winter period was 92,265; and assuming the rate of 61·3 per hour during daylight, and allowing for the slightly different hours of work in the engineering trade, the division is 61,405 accidents during daylight, and 30,860 in the 393 hours of artificial light. Therefore the accident rate in all industries and from all causes in 1913, during the hours of artificial light, was 79 2 per hour, as against 61·3 per hour for daylight. This is an increase of 29 per cent. under artificial lighting conditions. With accidents in connection with machinery moved by mechanical power, the increase with artificial light is 18 per cent.; while the increase in accidents due to persons falling shows an increase of no less than 71 per cent. during artificial lighting hours, when compared with daylight. Thus, while in all cases there is an increase in the accident rates for the period of artificial lighting, the increase is specially marked in the case of accidents due to persons falling.

There was an attempt made to obtain data with regard to accidents in mines, in which, of course, work is carried on with artificial light throughout the year. Statistics which would enable this to be done were unfortunately not available. A return of fatal accidents in mines, differentiated as "surface" and "underground," is, however, published monthly; and collating these for 1912 and 1913 [though eliminating the figures for the months affecting the national coal strike and the great Welsh disaster], the fact emerges that underground, where the lighting conditions are uniform, the accident rate was less in winter than in summer. On the other hand, there was a marked increase in the rate for accidents occurring in winter on the surface.

Influence of Lateral Illumination on Visual Acuity.

A statement by Dr. J. Herbert Parsons, reprinted from the reports of the Royal London Ophthalmic Hospital, on the subject of the influence of lateral illumination of the eye on visual acuity, forms one of the appendices to the report. This influence, it is stated, is one of considerable practical importance. The disagreeable effects of a bright light in the field of vision are familiar to everyone; but the cause of the distress, and how far it is seriously deleterious to the eyes, are points which have proved difficult to discover. Theoretically, various factors come into play—such as alterations in the size of the pupil, alterations in contrast, and fatigue As regards contrast, if the light-source is screened from the test-object, but not from the eyes, the illumination and the objective contrast between the object and the background both remain unchanged. Subjectively, however, the conditions are altered. Owing to the oblique incidence of the lateral light, the media of the eye are flooded with light, partly transmitted through the sclerotic, as well as through the refractive media, and partly reflected from various refracting surfaces, and thus unequally distributed. The conditions are complex; and it is scarcely possible to foretell the effects.

After referring to the work performed by various experimenters in connection with the subject at different times, it is remarked that Cobb ["Amer. Jl. of Physiol.," 1911] has investigated the question with great care; and his paper is the best which has yet appeared. By an ingenious method of testing, he arrived at a number of conclusions—among them, that light from a bright source entering the eye reduces the visibility of an object the more, the brighter the source the lower the brightness of the object, and the smaller the angle subtended by the two, except that, when the test-object is very bright, lateral illumination may cause increased visual acuity. Under a condition imitating the worst practical state for reading—the light at 10° from the visual axis, equal illumination of the eye and test-object [black letters on white ground]—the reduction in visual acuity is negligible at any intensity of illumination. The retinal image of the light is a negligible factor in the depression of vision—at least, for angles of 15° and over—since, the other conditions being equal, it is indifferent whether the image falls on the blind spot or on sensitive portions of the retina. The depression of vision is due to light which, by reason of reflection or diffusion, partly from imperfect transparency of the eye media, is scattered over the retina upon, and near, the image of the object. Visual acuity behaves in general, but not wholly, the same with illumination of the eye from a lateral source, and a haze of light thrown over the rod-free central retina [subtending 2° in the visual field], with proportional variations in the light flux in the two cases. There is no parallelism between the depression of vision for detail, on the one hand, and discomfort and other visual disturbances classed under the head of "glare," on the other hand, resulting from a light-source in the field of vision. Finally, Cobb agrees with the contention of another investigator that the unpleasant feeling of dazzling and the disturbance of vision produced by dazzling, are totally different things, and need not necessarily occur to the same extent at any given time. The discomfort may be associated with the eye movements.

Since that time, Cobb has made a further series of experiments, when it was found that different individuals may show fairly wide differences in their vision of objects of very low brightness, both with and without bright surroundings. In spite, however, of such individual differences, the relative changes in visual capacity caused by differences in surroundings were found to be, on the whole, in the same direction in cases of the same change in the conditions. For objects of relatively low brightness, the presence of a surrounding field of relatively high brightness has the effect of lowering the capacity of vision, both for detail and for brightness difference. In the case where the surrounding field was slightly brighter than the test-object, visual discrimination was found to be actually better, both as regards visual acuity and brightness difference than for a physically identical object seen in dark surroundings. Surroundings of a brightness about equal to, or less than, that of the test-object show no consistently better or worse results than dark surroundings with an identical test-object.

The succeeding appendix comprises an extract from a lecture by Professor Snellin, taken from the "Transactions of the Ophthalmic Society," nearly twenty years ago; and it is given as being of considerable interest historically. It records briefly work carried out with the object of answering the questions: "Is it possible to determine the minimum amount of light necessary to the workman with normal eyes for a certain sort of work?" And, further, "If such an amount of light is to be determined, is there a practical method to measure this amount?" In the endeavour to answer these questions, the following conclusions were arrived at: That in every workshop a minimum amount of 15 m.c. is necessary for work resembling reading, whereas a minimum of 10 m.c. will do for coarser work—like that of carpenters and blacksmiths; that in broad daylight the required amount is between 30 and 50 m.c.; and that it must be possible to exclude direct sunlight. Determinations of intensity can be done best by a Weber photometer.

(To be continued.)

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Directors' Report and the Accounts.

The report of the Directors of the Alliance and Dublin Consumers Gas Company, for the half year ended June 30, to be submitted at the meeting on the 30th inst., states that the accounts submitted show a profit on the revenue account of £59,340; and, after providing for interest on the debenture stock and temporary loans, there remains the sum of £50,471. The Directors have appropriated out of this sum £4083 in further reduction of the amount standing in capital account for ordinary and prepayment meters, and have placed to the credit of the special purposes fund the sum of £8119; being a contribution of 10s. per cent. on the capital of the Company for the year 1915. This leaves a balance of £38,268, to which must be added £12,145, the balance brought forward from last account, and a credit from income-tax account, amounting to £16, making a total of £50,429.

The Directors recommend the declaration of the maximum statutory dividend on the consolidated ordinary stock of the Company, at the rate of £5 2s. 6d. per cent. per annum, less income-tax. This will absorb a sum of £39,766, after which a balance of £10,663 will remain to be carried to the next account.

The Directors regret to have to announce the death, since the last half-yearly meeting, of their esteemed colleague, Mr. Richard S. Tresilian, J.P., and to state that Alderman Cotton, M.P., has resigned his seat on the Board.

The Directors feel confident that the shareholders will be very gratified with the results of the half-year's working, more particularly in view of the fact that since the commencement of hostilities they have not been compelled to increase the price of gas. On the contrary, in the Bray district, they have found it possible to make a reduction of 5d. per 1000 cubic feet, and, moreover, make substantial reductions in the price of gas used for power and manufacturing purposes.

The notice convening the meeting adds that (as special business) a proposal will be submitted "that a sum of £1000 be divided among the Directors resident in England as remuneration for their past special services to the Company; and that the sum available for the remuneration of the Directors be increased by the provision of a further sum of £500 per annum, same to be divided among the Directors resident in England."

Statements attached to the report show that the total amount of coal carbonized during the half year was 43,085 tons; that of 29,546 tons of coke made, as estimated, 13,018 tons (estimated) was used in manufacture; that of breeze made, to the estimated extent of 5563 tons, 3750 tons were used in manufacture; and that, while in December, 1914, the tar in store as estimated amounted to 283,736 gallons, there was produced during the half year 554,001 gallons, and sold 671,324 gallons. The amount of ammoniacal liquor in store in December, as corrected, was 432,481 gallons; the amount made during the half year, 1,162,810 gallons; the amount used, 1,398,651 gallons.

The gas made was 804,411,000 cubic feet (including 302,839,000 cubic feet of carburetted water gas); and the gas sold totalled 687,836,000 cubic feet, of which 37,723,000 feet were for public lighting, 650,113,000 feet for private lights per meter, and 12,824,000 feet were used at the works. The total quantity of gas accounted for was 700,660,000 cubic feet; unaccounted for, 103,751,000 feet. Public lights numbered 6331.

AUSTRALIAN GASLIGHT COMPANY.

The Annual General Meeting of the Company was held on Aug. 5—Mr. G. J. Cohen (the Chairman) presiding.

The Secretary (Mr. R. J. Lukey) having read the advertisement convening the meeting, the report of the Directors for the half year ended June 30, an abstract of which was given in the "Journal" last week (p. 602), was taken as read.

Effect of the War on Extensions.

The Chairman, in moving the adoption of the report, said: When I last addressed you, I referred to several matters which were hampering the usual progress attending the Company's operations; and though some of these difficulties have since been overcome, there are others still remaining, which have to be contended with. The continuance of the war, for instance, so seriously interfered with the extensions at Mortlake that it was found necessary to ask that the period for vacating the head station be extended for another year, which has been granted. Consequently, the Company will retain possession of the property until the end of July, 1916. Owing to the impossibility of securing freight in England for shipment of the balance of the material required for the new gasholder now in course of erection, the work has been greatly delayed. For the same reason, No. 4 retort-house cannot be completed by the time first stipulated; but every effort is being made to have the new plant in working order as quickly as possible.

THE MINERS' STRIKE.

The miners resumed work at the "Pelaw Main" Colliery, Maitland, in

March last, after having been on strike for nearly ten months, during which period the Company experienced great inconvenience and loss, through having to obtain coal, in many instances of an inferior quality, at greatly enhanced prices, and increased freight, to enable the supply of gas to be maintained. Although the strike terminated in March, the normal deliveries of coal were not resumed until the end of June.

THE HEAD STATION.

With reference to the Company's claim for compensation for resumption of the head station, negotiations are still progressing, and it is hoped that a satisfactory settlement will be arrived at during the current half year. The delay, although unavoidable, has certainly caused the Company much anxiety, as the new works to replace the head station have had to be proceeded with without any portion of the purchase money being obtained. The delay in the completion of the new plant prevents the Company from receiving the profitable return naturally anticipated from the extension. The balance of the machinery required is now coming forward as expeditiously as possible.

NEW CAPITAL.

The Directors have decided that the time has arrived for increasing the Company's capital; for, apart from what may be received from the Government for the resumption of the head station, a large sum has been expended at Mortlake to meet not only the present but the future requirements of the Company's business. It is therefore proposed to forthwith dispose of 50,000 "C" shares, under the conditions contained in the Gas Act.

INCREASED BUSINESS.

This being the annual, as well as the half-yearly, meeting of the shareholders, I purpose comparing, in part, both periods of the Company's operations. Regarding the consumption of gas, the increase has not been so great as formerly, owing doubtless to the economy observed in domestic affairs, and a falling off in building operations generally, as the result of the present disastrous war. Compared with the corresponding half year, the increase in gas sold has been 72,615,000 cubic feet, and for the year 251,447,000 feet, which is equal to an increase of 7 per cent. compared with the previous year. This, in the circumstances that I have already explained, is satisfactory; and I trust the increase will be maintained. The returns from residuals also show a substantial increase this half year. The adoption by the City and Suburban councils of electricity for public lighting naturally lowers the Company's output of gas; but we are not materially affected thereby, as the lamps were supplied without regard to pecuniary benefits—a fact, I fear, not sufficiently made known to the ratepayers interested. The present number of public lights supplied by the Company is 7264. The number of gas-cookers sold during the year is 3298; the total disposed of by the Company up to the present time being 40,048, while gas-fires and other gas appliances have met with increasing sales. The number of consumers at the end of the year was 125,858—an increase of 6013 on the number reported at the last annual meeting. The length of mains and services laid during the same period, including the new 36-inch main from Mortlake to the Haymarket, was 160 miles making the total mileage to date 3238.

EMPLOYEES AND THE WAR.

The Directors, with the view of assisting those of the staff and the permanent employees who were desirous of serving the Empire, notified them that their positions would be kept open, and the difference between the military pay and their salaries or wages made up by the Company. I am pleased to say 97 have taken advantage of this provision. The Company have also promised assistance to the Commonwealth authorities in the production of material required in the manufacture of munitions, and have also donated £250 to the "Australia Day" fund, which I am sure meets with your approval.

THE DIVIDEND.

In reference to the dividend, I may add that the reduction on the "C" shares is consequent upon the increase in the price of gas, and is in compliance with the sliding-scale of the Gas Act. The "A" and "B" shares, as you are aware, have already been dealt with, and, consequently, are not affected on this occasion.

The report was adopted and dividends for the half year declared at the rate of 7 per cent. per annum on the "A" and "B" shares, and 6 per cent. on the "C" shares.

The retiring Directors and the two Auditors having been re-elected for another year, the proceedings concluded with a vote of thanks to the Directors and officers for their efficient services.

WIGAN GAS PRICE INCREASE.

The fact was recorded in the "JOURNAL" for the 7th inst. [p. 530] that at the preceding meeting of the Wigan Borough Council there was a debate regarding the extent to which it would be advisable to increase the price of gas. The Committee had agreed to recommend an increase of price for all purposes of 8d. per 1000 cubic feet; but some councillors argued that this was insufficient, and that the rise should be 9d. Finally, the Committee agreed to take the minute back for further consideration. Possibly it will be remembered that an outstanding feature of the debate was a declaration that, though in the past they had given money to the relief of the rates, as now constituted the Gas Committee had no intention of giving any more.

A special meeting of the Council was held last Tuesday, to again discuss the subject; and then the Gas Committee presented a minute saying it had been resolved that the price of gas supplied through ordinary meters for all purposes be increased 9d. per 1000 cubic feet; that the quantity of gas to be supplied through prepayment meters for 1d. be reduced from 30 to 26 cubic feet; and that, in the event of a net profit being made at the end of the present financial year, the price of gas be reduced accordingly. In the course of the subsequent debate, Mr. M'Curdy

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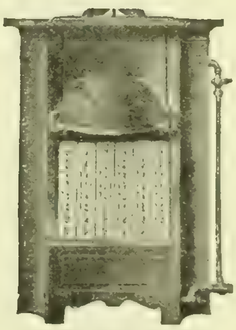
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expressed the opinion that the necessary increase in price was not the result of the war, but was due to the large amount of what he called "bogus profits" that had been paid over to the rates during the last thirty years. Before giving money to the rates they should sell gas at a reasonable price, and they should also see that the works were kept in a state of efficiency, which had not been done in Wigan. They would have to call in an expert; for the works had been starved of all mechanical appliances such as were to be found in up-to-date undertakings. They had power to create a reserve; but from 1885 to 1912 not a single halfpenny had been set aside for this purpose. The "plant" had been sacrificed in order to hand over large profits for the relief of the rates. The Chairman of the Committee to-day stood in the unenviable position of having to ask that the price of gas should be increased, chiefly on account of the unbusinesslike manner in which the undertaking had been carried on in the past. Alderman Fletcher and Mr. Alstead expressed agreement with these remarks; and Dr. Rees, speaking of the past, said he "looked upon the Gas Committee of Wigan as having been a lot of robbers more than anything else." The Mayor pointed out that the actual proposed increase in the price of gas worked out at about 7¾d. per 1000 cubic feet when the discount was taken off.

The Committee's recommendation, after other speakers had given their views, was agreed to.

RAILWAY CARRIAGE LIGHTING AND FIRES.

"A Fire was Inevitable" in the Gretna Train Disaster.

Reporting to the Board of Trade on the troop train disaster at Gretna, by which 227 persons were killed and 246 injured on May 22, on the Caledonian Railway, Lieutenant-Colonel Druitt, after reviewing the facts, says:

"Owing to the force of the collision, a fire was inevitable. I consider the cause of the outbreak in the main part of the wreckage was due to live coals from the overturned engine of the troop train; and this was afterwards intensified by the escape of gas from the cylinders as they burst. I consider that a fire would have occurred even if all the vehicles had been fitted for electric lighting, as a separate fire immediately broke out among the waggons of the goods train in the down loop, caused by ashes from the leading engine of the express train, which ran into them while they were covered with wreckage from the troop train."

The following recommendations are contained in the report:

Construction of coaches should, as far as possible, be of steel, with shock-absorbing buffers.

Any timber or other combustible material used to be rendered non-inflammable.

Special attention should be paid to the construction of doorways, so that doors shall not jam when a collision occurs.

Bars across windows to be easily removable, and windows capable of being opened to their fullest extent.

Provision of electric lighting in all new stock.

Gas lighting in existing stock to be abolished, and electric lighting to be provided as opportunity admits.

"I understand," Lieutenant-Colonel Druitt continues, "that some of the principal companies are carrying out the recommendation as to rendering timber used in carriage construction non-inflammable. Most of the principal companies are providing electric light in all new carriage stock, and some are arranging to convert existing gas-lit stock as opportunity occurs; but this must necessarily be a slow process, spread over many years. All express trains are, I believe, now provided with tools and appliances for extinguishing fires."

METROPOLITAN WATER BOARD.

Twelfth Annual Report—Year ended March 31, 1915.

The Clerk to the Metropolitan Water Board (Mr. A. B. Pilling) sends a copy of the annual report for the twelve months to March 31 last, as approved and adopted at the meeting of the Board on July 23. He also forwards an abstract of the report covering the most generally interesting particulars as to the immense undertaking administered by them.

This points out that the Board came into existence in 1903, under the provisions of the Metropolis Water Act, 1902. The third Board went out of office in June, 1913, when the fourth Board was elected in its place, and will go out of office on June 1 next year. The Board is constituted on the principle of indirect election—namely, of representatives (66 in all) appointed by the County Councils of London, Essex, Herts, Kent, Middlesex, and Surrey, and by the Borough Councils and Urban District Councils comprised within the 559 square miles statutory area of the Board. There are on the fourth Board 17 original members of the Board first appointed in 1903. The County distribution of the Board's statutory area is as follows:

County.	Area, Square Miles.		Acres.
London	116	..	576
Essex	107	..	56
Hertford	22	..	556
Kent	159	..	82
Middlesex	99	..	451
Surrey	55	..	160
Total	558	..	581

INJECTOR-VENTILATION.

NOISELESS THIMBLE BURNER.

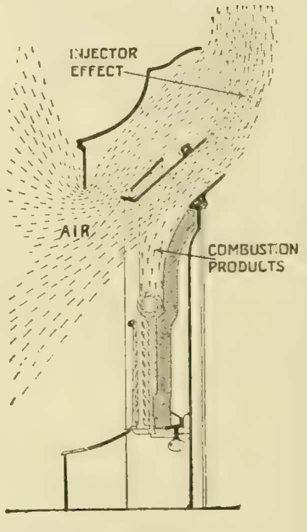
All our 1915 perfectionments are embodied in the entire range of our existing standard patterns—no new designs have to be created to embody these.

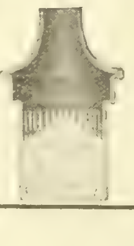
We expressly avoid reverting to the discarded system of perforations in the stove-body, where dust may collect.

The ventilating air is drawn from all points of the room.

It is passed through the hottest part of the stove, so avoiding all possibility of high-temperature convection.

There is no admission of air-currents in such a way as to cool down the whole stove-body, on which we count for that proportion of low-temperature convection, the indispensableness of which we have all along emphasised.





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The funded debt of the Board at April 1 was:

	Amount of Stock.	Interest.
Metropolitan Water (A) Stock	£6,060,165	£181,805
Metropolitan Water (B) Stock	35,181,889	1,055,456
Redeemable Debenture Stock	7,217,838	216,911
Mortgage Loan	387,000	15,480
	£48,846,892	£1,469,652

In addition to the annual interest shown, there are certain annuities and rent-charges amounting to £7900, or a total of £1,477,552—equivalent to 3 9d. per 1000 gallons supplied.

Water Rental and Deficiency.

The net water rental received by the Board during 1914-15 was approximately £2,933,400 or an increase of £22,690. It is satisfactory to state that, notwithstanding the disturbance caused by the war, the percentage of collection for the half year ended March 31 last, in respect of domestic supplies and fixed charges was 94·4, being the same as for the corresponding period last year.

The effect of the new charges imposed by the Board's Act, 1907, was to create a deficiency (the yield being less than that obtained under the Acts of the old Companies) which had grown to a sum of £359,454 by the end of the year 1914-15. But this deficiency is counterbalanced by the fact that the Board have set aside no less than £545,076 to a new works sinking fund—being bound to do so by law.

The audit of the Board's accounts for the year ended March 31, 1914, showed a certified deficiency of £15,385, as against an estimated deficiency of nearly £105,000. This satisfactory position was attributable to the fact that the income exceeded the estimates by about £70,000 (due to the favourable conditions of the summer of 1913), to a further reduction in allowances for empty premises, and to savings under the head of pumping and distribution charges. Precepts to meet this deficiency were duly issued on the contributory authorities.

The total rateable value of the boroughs and districts in the Board's area directly represented on the Board, and liable to meet precepts for any deficiency that may arise, is as follows:

In London	£45,341,614
In Extra-Metropolitan Counties	11,630,320
	£56,971,934

Staff and Offices.

The Board's staff numbers 923 officers (including 58 women), 3189 workmen and others on weekly wages, and 116 service staff on weekly wages, or a total of 4228 at April 1 last. This represents the normal establishment, after deducting the temporary workmen engaged to fill the places of men on war leave, whose names accordingly remain on the pay-sheets. The total salary list at the same date was £173,943.

A highly creditable percentage of the Board's officers and servants within military age have joined the Colours; so much so that, in some instances, leave has had to be refused, owing to the exigencies of the Board's service. At the end of August, four members of the Board, with 268 officers and 465 servants, were on military or naval duty. Those killed on active service numbered 23.

Head Offices.

New head offices are in course of erection on a portion of the site in the possession of the Board at New River Head, Rosebery Avenue. The well-known "Oak Room," which formed part of the original "Water House" erected in 1613, will be incorporated in the new structure. Sir Hugh Myddelton's "Round Pond" at New River Head, which had been in almost continuous use for over 300 years, was abandoned in June, 1914, in preparation for part of the site of the new offices.

Sources of Supply.

The Board's supply of water is derived from the Rivers Thames and Lea, the gravel beds near the Thames, the Chadwell Spring (which is the beginning of the New River), and wells sunk in the Lea Valley on the north of the Thames, in Kent, and certain other points south of the Thames. The Board's supply, direct and in bulk to adjacent undertakings) during the year was 89,420 million gallons of water, or a daily average of 245 million gallons. The grand total volume is equivalent to 399·2 million tons of water. The Thames furnished 58·5 per cent. of this total, the Lea 23·1 per cent., and the wells, &c., 18·4 per cent.

The total estimated population supplied by the Board at the close of the year was 6,744,247. It is estimated that 56 per cent. was supplied from the Thames, 24·7 per cent. from the Lea, and 19·3 per cent. from the wells and springs. Of the total population, 65·3 per cent. is north of the Thames, and 34·7 per cent. south of the river. The population inside London is 67·2 per cent. of the whole.

The daily average supply per head was 36·08 gallons, compared with 36·16 gallons in 1913-14.

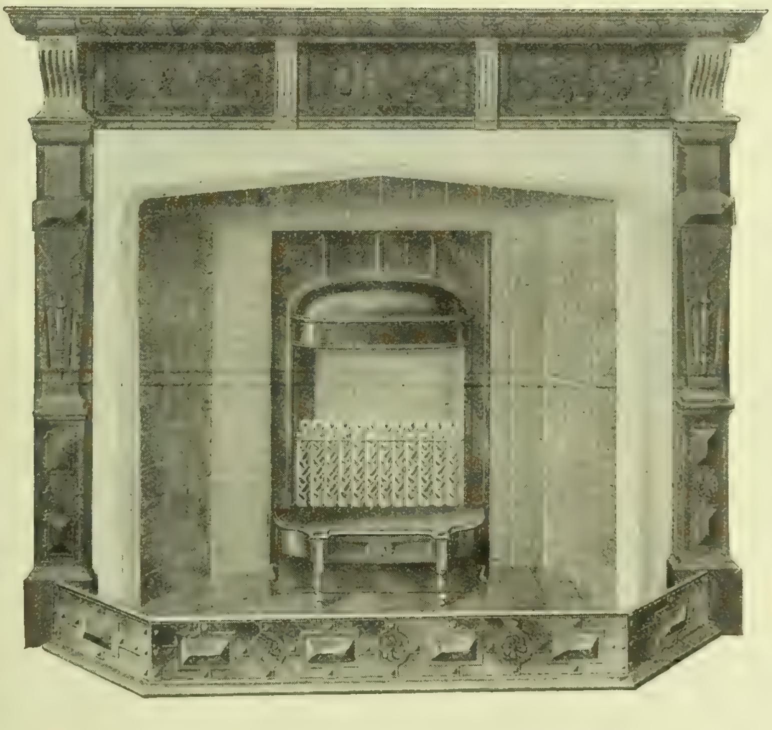
Storage.

The effective amount of storage and subsidence reservoir capacity for unfiltered water possessed and in use by the Board at the end of the year was as follows:

	Number.	Area in Acres.	Capacity in Million Gallons.
Thames Valley	31	1,026·5	7,267·5
Lea Valley	17	955·0	5,639·5
	48	1981·5	12,907·0

The Board are constructing a reservoir at Littleton, to contain 7000 million gallons—part of an authorized scheme to include a further reservoir to be constructed at Stanwell to contain 3300 million gallons. Considerable variations in the design of the Littleton works have been made, in order to improve the quality of the water and to cope with possible troubles arising from algæ growth. The net effect of the

One of the DAVIS 1915 Series of Gas Interiors



The Davis "JACOBEAN" Gas Interior, illustrating the appropriateness of the Fire to a setting of its period.

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omissions and additions in the proposed works showed an approximate saving on the contract of £40,150.

The Board have resolved that the supplies from the Littleton and Staines reservoirs should be so arranged as to be drawn upon as equally as possible; the intention being that the storage in the Thames Valley system is to be worked ultimately in a uniform manner, so that the respective periods of storage in all the Thames reservoirs may approximate—due regard being had to periods of drought and the avoidance of double pumping.

Incidental to the construction of the reservoir, it will be necessary to carry out certain works not comprised in the reservoir contract—for example, road widenings, a covered service reservoir, pumping station and plant, conduits, mains, filter beds, &c. The cost of these will amount to a considerable sum, which, however, cannot at present be stated, as the plans are being revised by the Chief Engineer (Mr. J. W. Restler); but it would appear that before water from Littleton can be brought into London, works already authorized by Parliament (including the Littleton reservoir, but excluding the proposed new reservoir at Staines will have to be executed at a cost of at least £3,000,000 on present war prices. It is essential to the maintenance of the supply that these works should be completed within the ensuing five years.

Research Work.

The Director of Water Examination (Dr. Houston) submitted his tenth report on research work during the year, which dealt with seven separate subjects. The report is not only of scientific interest, but of great practical importance.

Comparison of Works.

The following table shows the increases which have taken place under the Board in the active equipment of the water-works since the transfer of the undertakings:—

	June, 1904.	March 31, 1915.
Storage reservoirs for unfiltered water	44	48
Acreage	843	1,981·5
Capacity in million gallons	4,115·7	12,907·0
Service reservoirs for filtered water	75	87
Capacity in million gallons	244·5	312·0
Filter beds	137	172
Acreage	139	170·7
Engines	235	281
Horse power	32,177	43,306
Miles of water pipes	5,759	6,446

Too Much Light at a Gas-Works.—Last Friday, at the local Police Court, Mr. Thomas M. Gledhill was fined £1 for not obscuring lights at the Filey Gas-Works, of which he is Manager.

Increased Cost of Gas-Cookers in Germany.—The Association of German Manufacturers of Gas-Cookers has announced that, owing to prevailing conditions, it found it necessary (in the middle of August) to raise the price of all gas cooking apparatus by 25 per cent.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

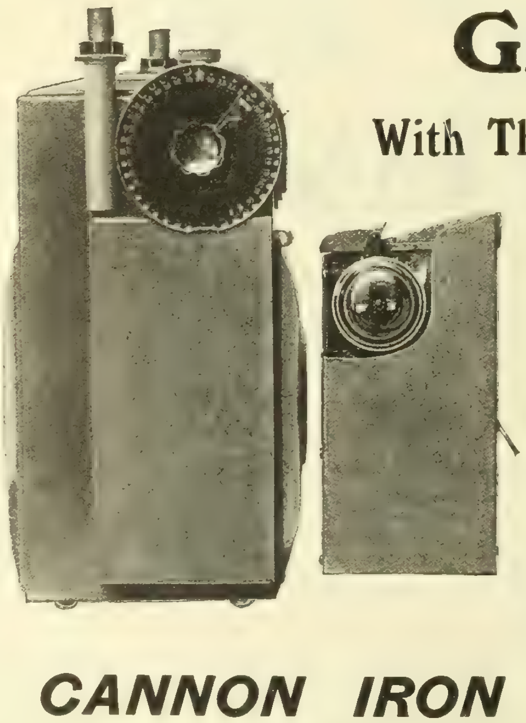
Before a Lands Valuation Appeal Court for the Burgh of Edinburgh—Lord Provost Inches presiding—the Edinburgh and Leith Gas Commissioners appealed against the assessment of their undertaking within the burgh at £76,932. The figure suggested by the Commissioners was £72,190. They desired that £4896, the amount of income-tax, should be deducted from the revenue of the undertaking for the purpose of assessment. For the Assessor, it was stated that the income-tax was a personal charge. The assessment was based upon the rent, which was already ascertained before the income-tax was paid; and therefore the deduction could not be allowed. The Court were of opinion that income-tax did not form one of the deductions in calculating rent. Therefore they upheld the Assessor, and dismissed the appeal. They were asked to state a case for appeal.

At the Coatbridge Court, the Coatbridge Gas Company appealed against their valuation being returned at £5834, and suggested £4378 as a fair return. On their behalf, it was pointed out that the Assessor wished to alter the system, and assess the Company on the average profits for the past three years. This meant that the Company would require to pay twice over. They had no objection to the three years' basis starting now, but did not want to go back. The Court agreed to assess on the past two years, instead of three; and fixed this year's valuation at £5165 10s.

The "Dundee Advertiser" a few days ago extracted from the recently issued volume of statistics of the London County Council [see *ante*, pp. 385-92] figures relating to the gas and electricity supply of some Scottish towns—showing that in the matter of the price of gas, Dundee compares favourably with most other places. The highest price per 1000 cubic feet at the date of the figures was at Dublin (Company) 39·18d. This appears to have been exceptional, it is remarked, for Swansea (Company) comes next with 33·61d.; Edinburgh is 31·31d.; Aberdeen, 26·26d.; Dundee, 25·51d.; Glasgow, 22·71d. Sheffield (Company) is lowest at 14·89d. In the matter of electricity, Newcastle (Company) is lowest at 0·91d. per unit sold, and Dublin (Municipal) highest at 2·85d. Dundee is 1·25d.; Glasgow, 1·28d.; Aberdeen, 1·38d.; Edinburgh, 1·80d. In the case both of gas and electricity, the supplies in the Scottish cities are provided by the Municipalities concerned.

The Oban and District Gas Company, Limited, have had their yearly valuation for assessment reduced from £300 to £200. The Assessor calculated on the value of the works when acquired for £6500 at 5 per cent. The works have been in existence for twenty years; and it is stated that there is no real rivalry between gas and the electric light. It is anticipated the Gas Company will be ultimately prosperous.

At Coatbridge the Valuation Assessor has desired to alter the usual system, and assess the Gas Company on the average profits for the



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past three years. The Court agreed to assess on the past two years, and fixed this year's valuation at £5165 10s.

The accounts for the Gas Department of the Greenock Corporation for the year ending June 30 show a surplus of £1600. Gas-heaters are said to be more in request this year.

The report of the Turriff Gas Company for the year ended June 24 shows the sum at the credit of profit and loss account to be sufficient for a dividend of 5 per cent (free of income-tax) on the paid-up capital of the Company—leaving to be carried forward, £74. The Directors recommend that the price of gas this year be 6s. 10d. per 1000 cubic feet for lighting, and 6s. 1d. for cookers and motors.

In consequence of the increased price of coal, the Oldmeldrum Town Council have found it necessary to increase the price of gas 1s. per 1000 cubic feet. The advance applies to gas used both for lighting and heating purposes.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Sept.* 20.

No fresh feature has arisen in the London tar products market. There are some inquiries for pitch; and the makers of the best qualities quote 26s. net per ton f.o.b. makers' works. Creosote remains at 4¼d. net in bulk at makers' works, and solvent naphtha at 2s. 1d. net on the same conditions. The good weather is enabling considerable quantities of pitch and freed tar to be put on the roads.

Sulphate of ammonia is also unchanged at £14 8s. 9d. net per ton, filled into buyers' bags at makers' works for 25 per cent. quality.

Tar Products in the Provinces.

Sept. 20.

There is little or no alteration in the market for tar products. No business of importance is reported in pitch, and prices remain in about the same position. Solvent and heavy naphthas are in good demand. Creosote continues weak.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 3d. to 25s. 3d. Pitch, East Coast, 21s. 6d. to 22s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. Clyde. Benzol, 90 per cent., North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Coal tar crude naphtha, in bulk, North, 6½d. to 7d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2⅞d. to 3d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 5d. to 3s. 6d. Naphthalene, £12 to £20; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

Liverpool, *Sept.* 18.

There is no change to report either in the tone of the market or in the value of this material, lethargy having prevailed throughout the week. Both producers and purchasers have been inclined to await further developments, and consequently trading has only been on a small scale. The nearest values at the close are still £14 10s. per ton f.o.b. Hull, £14 12s. 6d. f.o.b. Liverpool, and £14 15s. f.o.b. Leith. In the forward position, manufacturers have not made any alteration in their quotations—£14 17s. 6d. per ton for October-December, and £15 for January-June, at the chief ports—without actual business.

Nitrate of Soda.

The market for this article is easier on spot, and prices have declined to 13s. 4½d. per cwt. for ordinary quality, and 14s. 1½d. for refined.

Sulphate of Ammonia.

From another source it is stated that this market is still steady; but not much business of importance has been reported during the past week. Outside London, makes are quoted at £14; Hull, £14 7s. 6d. to £14 10s.; Liverpool, £14 10s. to £14 12s. 6d.; Leith, £14 12s. 6d. to £14 15s.; Middlesbrough, £14 10s.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade in the North is still affected by the lack of ready steamers, and the fact that licences for coal export are not very freely granted. This has had most effect on the steam coal trade, so that its prospects are uncertain at present. Best Northumbrian steam coals are quiet at 17s. 9d. to 18s. per ton f.o.b.; second-class steams are 16s. per ton; and steam smalls are dull and plentiful at 11s. 6d. to 14s. 6d. per ton f.o.b., according to the quality. Exports of coals are being freely made to French and Italian ports; but they seem to be more restricted to the North of Europe, and the high freights are a further deterring influence. In the gas coal trade, the demand appears a little better. Best Durham gas coals are about 19s. per ton f.o.b., and there is rather more activity both for home use and for export to the allied countries. Second-class gas coals are unaltered at near 16s. 6d. per ton; and "Wear Specials" are relatively steady at 20s. per ton f.o.b. Steamers are difficult to charter, except at high freights—8s. 3d. to 8s. 6d. Tyne to London for gas coals being quoted, and as high as 19s. 6d. Tyne to Rouen. There is not much doing in new contracts for coal, for the outlook ahead is rather doubtful; and though the deliveries of gas coal are fairly good, yet other kinds of Durham coal are plentiful, and make the markets occasionally easier. In the coke trade, the inquiry is fair. Good gas coke is generally firm at from 28s. 6d. to 30s. per ton f.o.b. in the Tyne.

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Woking District Gas Company.

The Chairman (Mr. C. H. Master, J.P.), in moving the adoption of the report [*ante*, p. 536] at the half-yearly meeting, said that, with the uncertain train and shipping service, and other difficulties, they could imagine what an anxious time their Manager (Mr. W. H. Ely) had gone through. It was an abnormal period; and they had had to raise the price of gas at Woking, as at other places. The Board quite realized that if they could keep the price of gas down [it was now 4s. 6d. per 1000 cubic feet], they would get more trade; but Woking was not a concentrated district. Their mains represented something like forty miles; and taking into consideration this fact, and the population, they would see that it was almost impossible for any company, however well looked after, to furnish gas at what might be called a really low rate. Woking was increasing, and their business was growing; so that there was need for further producing plant. Accordingly the Directors had committed themselves to an outlay of some £4000; and more capital would have to be raised. The report having been adopted, and the dividends recommended declared, the Directors, Secretary (Mr. B. Dennett Holroyd), Manager, and staff were thanked for their successful working during a very difficult time. Thereafter a special meeting was held, at which the Board were authorized to issue a certain amount of new capital, as needed.

Keighley and War Expenditure.

Inasmuch as there are very few public works of any kind now in hand at Keighley which are not essential to keep the industries of the town going—and many of these industries being engaged on Government orders—it is not anticipated that these works will be affected to any marked extent by difficulties with the Government Departments over the question of expenditure in war time. The Town Council recently entered into contracts for extensions to the existing electricity plant involving an outlay of close upon £20,000. They were threatened with a stoppage of the work by the Local Government Board until explanations had been entered into to show that, unless the extension were proceeded with, the Corporation could not meet the demand for current for power purposes, and the slightest accident might very easily lead to a stoppage in the local factories and workshops dependent on electrical power, and consequent delay in delivering Government orders. Having regard to these considerations, the Board eventually agreed to the whole of the proposed improvements and extensions being proceeded with. The Council had to go through much the same process in respect of the installation of new plant at the gas-works. At one point they were threatened with considerable delay owing to the withdrawal of men for direct Government employment; and representations had to be made as to the importance of completing the contracts with all reasonable speed, in order to obviate interference with the local industries through a gas-works breakdown. The only other undertaking of any size the Corporation have in hand is the new Sladen Valley water-works; and this work is as essential to the industrial well-being of the town as the other two extensions. The work has not advanced very far, having been in progress only a year or two; and, even under the most favourable conditions, it would probably take another four years to complete. Long before this time, there is grave danger of Keighley suffering from a shortage of water.

Electricity and Gas at Hove.

A proposed increase of 20 per cent. in the charge for current by the Hove municipal electricity undertaking, has led to the following pertinent remarks by the "Sussex Daily News," which says that tradesmen are not inclined to accept the increased tariff with complacency: "One feature of the situation has raised an important question. How is it the decline in the sales of electricity became so alarming in the quarter of the year of the war when the days are longest, the nights shortest, and therefore the lighting restrictions were the least operative? It was not until the March to June quarter that the discrepancy was sufficiently noticeable to require an alteration in the charges. The quantity of units taken for the lighting of public streets in Hove is, under the most favourable conditions, a mere bagatelle. Nearly all the public lamps are supplied with gas. The electricity consumed in shops or business establishments during the March to June quarter would be the smallest of the entire year. Yet in this period the consumption fell off 26,397 units, representing a loss of £780. Concurrent with this decrease of business in electric lighting in Hove, the Brighton and Hove Gas Company report one of the largest increases in gas sales ever recorded in the district. There is a widespread impression in Hove that there must be some significance in this extraordinary contrast in the experiences of two undertakings carrying on a similar line of business. The force of the comparison is enhanced when due allowance is made for the fact that the Gas Company's loss on account of street lighting restrictions in Hove was £1800. No doubt the Gas Company's loss on account of street lighting was set off by the increased use of gas for cooking and heating; but it is not forgotten that the electrical experts have been straining all their resources for years to popularize electrical cooking and heating appliances. Without some fuller explanation, there would seem to be no logical reason why the lighting restrictions in themselves should produce such a difference in their effect upon the two systems of lighting. The causes are probably slow to reveal themselves. It is rumoured that many consumers of electricity, in view of the announcement that, in cases of emergency, the whole current will be cut off at a moment's notice, are preparing to rely in future upon the gas service."

Coal Shortage in Sweden.—There is said to be great anxiety in Sweden because of the non-delivery of coal from England. The gas-works are especially hard pressed; and many private factories are in a desperate position. From Sept. 1, 250,000 tons of coal were expected each week; but instead of this, the restriction on the exports has been such that supplies from England have practically stopped.

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Bexhill Water and Gas Company.

The Directors report that the accounts for the half year ended June 30 show a balance at credit of profit and loss account available for dividend of £8013. They recommend that a dividend be declared for the six months at the rate of 6½ per cent. per annum on the £34,000 authorized by the Acts of 1885 and 1892, and at the rate of £4 11s. per cent. per annum on the £123,710 authorized by the Act of 1896, Order of 1901, and Act of 1904, less income-tax. This, with provision for income-tax, will absorb £3919, leaving £4094 to be carried forward. The revenue amounted to £13,507, as compared with £12,732 in the same period of 1914, being an increase of 6 per cent. The high prices of fuel and stores consequent on the war, and also the scarcity and cost of labour, have caused the Directors considerable anxiety. Gas coal, while far more costly, and at times difficult to obtain, has been of mixed quality, yielding less gas and less coke per ton carbonized; while special expenses on watching and guarding the works have still further raised the expenditure. These exceptional charges have hitherto been in a large measure met by the increased business of the Company, as well as by the efficiency of the new retort-house; and it is gratifying to the Directors that the working of the Company under so many adverse circumstances enables them to recommend the same dividend as last year. In view, however, of the conditions mentioned, and the great uncertainty as to the duration of the war, they have decided to increase the price of gas 3d. per 1000 cubic feet as from the next Michaelmas readings.

Stretford Gas Company.

The report presented at the 125th half-yearly meeting of the Company stated that the profit for the six months ended June 30 was £5880; and adding to this the balance of £2420 brought forward, made the amount disposable £8300. The Board deemed it necessary and prudent to further write-down the investments of the Company to their value as on June 30; and they had therefore applied £738 to this purpose, thus reducing the disposable sum to £7562. The Directors recommended dividends at the rate of 10 per cent. per annum on £25,000 and 7½ per cent. per annum on £14,000 original £5 shares, 7 per cent. per annum on £61,000 new "A" £10 shares, and 5 per cent. per annum on £40,000 new "B" £10 shares. These would absorb £4910, leaving £2652 to be carried to the next account. Fifty-two of the Company's staff have gone on active service; and following the example of corporations and other public bodies, the Company are treating their dependants liberally. The loss of these employees has somewhat inconvenienced the Company; but the remaining members of the staff have shown a most praiseworthy desire to meet the difficulties of the position. The Chairman (Mr. W. A. Nicholls) said that the main points they had to consider were the troublesome times the country was experiencing, the high price of coal, and the lower prices of residuals than they anticipated. The only residual that would give a favourable return would be coke, the price of which would be dependent upon the price of coal. The Coal Prices (Limitation) Act would not affect the Company's finances except to a very slight extent. As to labour, they might have trouble in getting sufficient men to deal with the coal during the winter. They had in their employment sufficient for gas manufacturing purposes. The outside work, however, could only be carried on under great difficulties, as the staff was less than half what it was twelve months ago. In order to encourage men to come to them, they advanced the wages last February to the extent of about 7½ per cent. In addition, they had since given a bonus of 5 per cent.; and they were putting another bonus of 5 per cent. aside, which would be paid to every man in their employment next Easter. They were recognized as a munitions works; and their men of military age were wearing a Government badge. The outlook for the next twelve months was anything but rosy. The estimated expenditure would be £13,000 up; and it was doubtful if they would be able to pay the dividends without absorbing the undivided profits now in hand. It was stated during the meeting that the increase of 4d. per 1000 cubic feet in the price of gas in Stretford compares favourably with the increases made by some neighbouring companies.

Unauthorized Extinction of Street-Lamps.—The following official notice points to the need for damping the ardour of amateur "lamp extinguishers" in London: "The Commissioner of the Metropolitan Police desires to draw attention to the fact that any person unlawfully extinguishing a street-lamp in the Metropolitan Police district commits an offence, and is liable to summary arrest. The present reduction of street lighting has been effected in accordance with a considered scheme; and if unauthorized persons take it on themselves to extinguish street-lamps, great confusion and danger may be created.

A Comparison of Gas and Electricity.—In connection with suggested activity on the part of the Electrical Distribution Company of Yorkshire, Mr. J. H. Brearley, Consulting Engineer to the Penistone Gas Company, attended a meeting of the Urban District Council, and suggested that if electricity was to be introduced the best course would be for the Council to apply for an Order. Comparing gas and electricity, he said that the latter at 4d. to 4½d. per unit for lighting was twice as costly as gas; while at nine-tenths of a penny for power it had no advantage over gas. In his own district, electric motors had been taken out and replaced by gas. He further argued that competition would not tend to reduce the price of gas.

Street Lighting at Hackney.—The Hackney Borough Council have been recommended to exercise the option given to them under the arrangement made with the Gas Light and Coke Company in 1910, when inverted incandescent burners were substituted for uprights in the street-lamps, whereby such arrangement is to continue for a further period of five years, with a reduction of price at the rate of 5 per cent. from the charges at present being paid—viz., £2 3s. 6d. per lamp per annum for the gas, lighting, repair, and maintenance of each lamp fitted with one burner, £3 8s. 6d. per lamp per annum for each lamp fitted with two burners, and £4 13s. 6d. per lamp per annum for each lamp fitted with three burners. These prices to be irrespective of any variations in the price of gas during the contract period.

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Price Raised at Malton.—The Malton Gas Company have advanced their charge for gas 3d. per 1000 cubic feet; a corresponding increase being arranged in regard to consumption through prepayment meters. The new price will come into force about the 1st prox.

Street Lighting at Harlow.—The lighting question was considered at the last meeting of the Harlow Parish Council, when the Lighting Committee reported that they had resolved to recommend the Council not to accept the tender of the Gas Company for the lighting of the public street-lamps, owing to the restrictions of the Lighting Order. The Chairman of the Lighting Committee (Mr. Baker) reminded the Council that at a previous meeting it was suggested that they should light only a certain number of lamps at dangerous corners. A letter from the Gas Company had been received which gave several alternative prices.

Primitiva Gas Company of Buenos Ayres.—The accounts from Buenos Ayres for the half year ended June 30 have been received; but the Board regret that they do not permit the declaration of any interim dividend on the ordinary shares for this period. The action of the British Government in practically prohibiting the export of gas coal has prevented the shipping of coals for which they had contracted, and has compelled them to purchase in the United States at very high prices. The falling off in the profits is more than accounted for by the consequent high cost of coals and freights, which show an increase of no less than 14s. 10d. per ton over the corresponding period of last year. The Company appealed to the Municipality of Buenos Ayres for permission temporarily to increase the selling price of gas, in order to meet this abnormal state of things, but without success. Although there are indications of returning prosperity in Argentina, these have not yet matured in the City of Buenos Ayres; and the Company have had a further falling off in the consumption of gas for the half year under review.

Further Increase in Price at Stalybridge.—The Stalybridge Town Council have unanimously approved minutes of the Gas Committee recommending that the price of gas be increased 3d. per 1000 cubic feet as from the 25th inst. It was pointed out that when the Committee budgeted in March for the price of gas, they fixed it at 2s. 9d., but with a promise that there should be a revision in September. Coal is now costing more than had been anticipated; and residuals are selling at considerably less. This and other considerations make the present recommendation necessary.

Stoppage of New Water-Works at Bradford.—In regard to the suspension of operations, by instruction of the Local Government Board, upon the duplicating of the Bradford water-main from the Nidd Valley to the city [*ante*, p. 603], it is felt in the city that the danger of a shortage next year is so serious that further efforts must be made to get the sanction of the Board to proceed with the scheme, in connection with which a good deal of work has already been done. The Water Committee have expressed regret that the Board had adopted such an attitude in regard to the scheme; and a deputation has been appointed to wait upon the Board and the Treasury to urge that the work be allowed to proceed.

APPLICATIONS FOR LETTERS PATENT.

12,740.—DRÖSSEL, F. A., "Burners." Sept. 6.
12,756.—CURRY, M., and WOOD, N. O., "Fire-bricks." Sept. 6.
12,776.—BIRD, H., CORT, R., AND SON, LIMITED, "Charging retorts." Sept. 7.
12,878.—ANDERSON, J., "Gas-meters." Sept. 8.
12,968.—BENTLEY, J. E., "Gas-regulators." Sept. 10.
13,025-6.—ANDERSON, J., "Gas-meters." Sept. 11.

GAS COMPANIES IN THE STOCK EXCHANGE.

Business on the Stock Exchange was again at very low pressure last week. Daily it became quieter and quieter, reaching its *nadir* on Saturday—the great Jewish Fast day, when the House might to all intents and purposes as well have been closed. The general tendency was towards easier prices—a not unnatural recoil from the free advances recently scored. But additional factors tending to shake firmness were the regrettable manifestations of sharp differences of opinion in Governmental quarters upon matters of supreme importance, and the ceaseless insurgency of labour difficulties. Thus the War Loan and kindred securities were a falling market. Stronger points were in Americans and Canadians; the harvest reports in the Dominion continuing to be highly satisfactory. South Africans were firm. Armaments and munitions were still in demand; but a set-back was apparent in shipping undertakings. A good deal of feeling on the part of the latter has been aroused by the directors of one of them proposing to take powers to reject a transfer of shares to any person not approved by them. If such powers were exercised capriciously or dishonestly, it would be intolerable; but it is conceivable that such powers in some circumstances are to be desired. For example, if the directors got wind of a plot to secure a controlling interest in the concern in the hands of alien enemies, how else could they defeat it? It is all a question of confidence in an honest board. Business in the Gas Market was a little bigger than the week before—it did not require a microscope to see it. But there was not enough to afford any indication of a tide in prices either way. In the Money Market conditions of marked ease prevailed.

Bargains done for cash during the week were as follows: On Monday, Bombay 5, $5\frac{3}{16}$, Gas Light ordinary 78½, 79, 79¼, Primitiva $2\frac{15}{32}$, ditto preference $3\frac{15}{32}$, South Metropolitan 80½, ditto debenture 60. On Tuesday, Commercial 4 per cent. 84¾, 85, ditto 3½ per cent. 81, 81¼, Gas Light ordinary 78½, Liverpool 96, Primitiva 2⅜, ditto preference 3⅜. On Wednesday, Gas Light ordinary 78½, 78¾, 79, ditto debenture 62½, Melbourne 96¾, South Metropolitan 80, ditto debenture 60¾, 61. On Thursday, Gas Light debenture 62½, South Metropolitan 79½, 80, ditto debenture 60½, 61. On Friday, Brighton and Hove debenture 87, 87¼, South Metropolitan 77, 78¾, 79½, 80. On Saturday, Brighton and Hove ordinary 127½, 128.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING SEPT. 18.

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.	
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	..
374,000	.	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	.
280,000	5	April 29	7½	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	$5—5\frac{3}{16}$
50,0 0	10	Feb. 26	16	Bournemouth Gas and Water { 10 p.c. . .	29—30	5 6 8	..
873,480	10	"	7	B 7 p.c. .	15—15½	4 10 4	..
95,000	10	"	8	Pref. 6 p.c.	13½—14	4 5 9	..
—	—	—	—	Deb. . .	..	—	..
880,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
830,000	"	"	11	Do. New . . .	204—209	5 5 3	..
50,000	"	"	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
206,250	"	June 11	4	Do. 4 p.c. Deb. .	91—93	4 6 0	..
217,380	Stk	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	"	"	8	Do. A Ord. Stk. .	154—159	5 0 8	127½—128*
530,000	20	Mar. 26	12½	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	Do. 4½ p.c. Pref. .	4-6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	84¾—85
560,000	"	"	5⅛	Do. 3½ p.c. do. .	103 - 105	5 1 6	81—81¼
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	..
800 000	Stk.	"	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	"	"	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	Derby Con. Stk. . . .	123—125	4 16 0	..
55,000	"	—	4	Do. Deb. Stk. .	102—104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd. . . .	17½—18	5 11 1	..
16,362,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke { 4 p.c. Ord. . .	98—102	4 15 6	78½—79¼
2,600,000	"	"	3½	3½ p.c. max. .	76—79	4 8 7	..
4,062,235	"	"	4	4 p.c. Con. Pref.	96—99	4 0 10	..
4,674,850	"	June 11	3	3 p.c. Con. Deb.	72½—74½	4 0 6	62½
130,000	"	"	10	10 p.c. Bonds .	..	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16½—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c. . . .	..	—	..
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C . . .	151—154	5 2 4	..
65,780	"		6⅞†	Do. B	115—118	5 8 0	..
65,500	"	June 26	4	Do. 4 p.c. Deb. . .	92-94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental .	150-160	5 12 6	..
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c. .	119—121	5 7 5	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. { A	211—213	4 13 11	96*
718,100	"	"	7	B	146—14	4 14 7	
306,083	"	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	..
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne } 4½ p.c. Deb.	99—101	4 9 1	96¾
541,920	20	May 28	4	Monte Video, Ltd. . .	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	98½—99½	4 10 6	..
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	..
300,000	Stk.	May 14	8	Oriental, Ltd. . . .	117—122	6 11 2	..
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .	7¼—7¾	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B . .	128—131	4 19 3	..
100,000	50	"	12	Do. C . .	118—121	4 19 2	..
52,000	50	"	10	Do. D . .	..	—	..
249,980	5	April 29	8	Primitiva Ord. . . .	5½—6	6 13 4	2⅜—2
499,960	5	June 26	5	" 5 p.c. Pref. .	4¾—5	5 0 0	3⅜—3
521,600	100	June 2	4	" 4 p.c. Deb. .	91—93	4 6 0	..
—	—	—	—	" " " 1911	..	—	..
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo { 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 3	..
209,984	"	"	10	Do. B	222—224	4 9 8	..
523,500	"	"	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African . . .	10½—11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	77—80½
1,895,445	"	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	60-61
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	..
60,000	"	"	5	Do. 5 p.c. Pref. .	110—112	4 9 3	..
—	—	—	—	Do. West Kent. .	..	—	..
137,058	"	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord. . .	99—102	4 18 0	.
120,000	Stk.	Feb. 12	7½†	Tottenham District { A 5 p.c. .	135—138	5 8 8	..
742,275	"	"	6†	B 3½ p.c. .	115—117	5 2 7	..
181,255	"	June 26	4	4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	"	"	6⅞	" B 3½ p.c.	129—134	5 2 7	..
108,075	"	"	5/17/3	" C 3½ p.c.	110—115	5 2 0	..
352,000	"	"	6⅛	Wimbledon 5 p.c. .	117—122	5 0 5	..
98,000	"	"	6⅝	Epsom 5 p.c. . . .	121—126	5 5 2	..
88,416	"	June 26	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

* Ex Div.

Reported Scarcity of Petroleum and Coal Gas in Germany.—The Amsterdam correspondent of the Central News learns that petroleum and coal gas are so scarce in Germany that the people have been advised by the authorities to use alcohol in various forms for illumination purposes—there being a sufficient quantity for the purpose.

History of Gas Lighting in Bradford.—Last week saw the ninety-second anniversary of the first use of gas in Bradford. It is recalled that the occasion was the outcome of very long and careful thought and consultation with Counsel; it being eventually decided by the Commissioners of the town to contract for gas lighting instead of oil, provided the cost amounted to not more than the average of the preceding three years with oil lighting. The Bradford Gaslight Company was then formed, with a capital of £15,000, in £25 shares, who offered to light the town for £210 per year. The Company were later taken over by the Bradford Corporation for £210,000.

Less Stringent Lighting Regulations at Manchester.—The regulations concerning the lighting of Manchester thoroughfares have again been under the consideration of the City Gas Committee, with the result that arrangements are being made for improved lighting during the winter months. The department has been in communication with the Home Office, and permission has been given for a better diffusion of the light from public lamps. It is understood that there will not be any great addition to the present number of lights; but the shading of the lamps will be considerably reduced, particularly at busy corners and crossings, where, under the regulations hitherto enforced, many pedestrians have felt there was always an element of danger.

Knowle and District Gas Company, Limited.—The result of the Company's trading for the year ended June 30 (after paying debenture interest and providing for depreciation) is £790, making, together with £192 brought forward, £985. The Directors in their report state that they have added £200 to the reserve fund; and they recommend a a dividend of 10 per cent., less income-tax, on the paid-up capital. The balance carried forward will be £298. The working statement of Mr. F. J. Ward (the Manager and Secretary) shows that the total output of gas was 13,833,000 cubic feet; the make per ton of coal carbonized being 13,715 cubic feet, and the sale per ton 12,823 feet. The amount of unaccounted-for gas was 4·24 per cent. on the make. There are 422 consumers, and close upon 10 miles of mains.

Newcastle (N.S.W.) Gas Company.—At the 98th half-yearly meeting of the Company, Mr. J. R. Hall (the Chairman) said the profit for the past six months was £277 more than for the corresponding period of last year. It would have been possible to have paid the same rate of dividend as formerly, by encroaching on the balance brought forward; but the Directors thought it more prudent, at a time like the present, to strengthen rather than weaken the reserves. The dividend recommended was 7 cent. on the "A" and "B" shares, and proportionately on the "C" shares. This compared favourably with the rate paid by other gas undertakings similarly circumstanced, notwithstanding that the Company charged 4d. per 1000 cubic feet less than any other Company in Australia. The Directors had thought of applying to the Minister for permission to increase the selling price; but after consideration they decided the present was not an opportune time.

Warning to Gas Consumers.—The Chairman of the Gas Committee (Mr J. Stott), addressing the members of the Hindley Urban District Council at last week's meeting, said it was essential that gas consumers should know the difficulties which the gas management were labouring under at the present juncture. Shortage of labour was playing havoc with them, and what was going to be done he really did not know. He wished to give warning to consumers to be as careful in their consumption of gas as they possibly could. The Manager (Mr. H. O. Timmins) and his staff were doing all they possibly knew how to do. It was rather awkward to have to mention the difficulties; but if they were only appreciated, there would not be so many complaints coming to the office, and people would bear with them and accept their excuses as reasonable. In the event of a shortage—he did not say there would be one—it would be unreasonable to let the people be in a dilemma without being prepared, and having made some provision. He made these remarks in order that consumers might economize, and that some reasonable excuse might be made for the management and the staff.

Southport Water Board.—At the last meeting of the Southport, Birkdale, and West Lancashire Water Board, the Clerk (Mr. Alleyne Brown) read a draft copy of an application to be made to the Local Government Board for a Provisional Order to alter the constitution of the Board by providing for the representation of the Formby Urban District Council, and the amount of the contribution to be paid by the Formby Council in respect of any deficiency in the net revenue. An arrangement was made in 1905 for the express benefit of the Formby Urban District Council, by which they were not to contribute until Sept. 30, 1915. As far as representation was concerned, the Water Board submitted that, as the Southport Corporation now had ten members on the Board, and the West Lancashire Rural Council had two members, it was a fair and reasonable proposition to allocate three members from the Formby Urban District Council. The draft also stated that the provision that the representation of Southport on the Board should exceed by not more than one member the combined representation of the other Councils, had had no bearing on this question since the union of Southport and Birkdale in 1911. The basis of contribution had in the past been the rateable value; and it was submitted that no better basis could be suggested. They therefore applied to the Local Government Board to alter the constitution so as to provide that it should consist of fifteen members, ten to be appointed by the Southport Corporation, two by the West Lancashire Rural District Council, and three by the Formby Urban District Council. The Board had approved the draft of the application. The proposal is an important one, as it means, if approved, that Formby will contribute a portion to any future precept of the Water Board. In his annual report last May—setting forth the estimate of rates for the current year—the Southport Borough Treasurer (Mr. George Lloyd) said that the Water Board precept last year was £11,232. The estimate as advised for this year is £12,980—an increase of £1748, equivalent to a rate of ¾d. in the pound. The Corporation levied a rate of 6d. in the pound to meet it.

Damage estimated to amount to £10,000 resulted from a fire last week at the Victoria Saw Mills, Sheffield. The cause of the outbreak is stated to have been a gas explosion in the mills.

The will has been proved of Colonel Thomson Wilson, J.P., a Director of the Beccles Water-Works Company, and Alderman and six times Mayor of the town. He left property of the gross value of £15,789.

The death is announced, at Atherstone, of James Thomas, the tallest man in Warwickshire, who stood 6 ft. 6 in. high. He was a lamplighter; and his stature enabled him in many places to dispense with the usual pole.

At a meeting of the York City Council last week, a member moved an amendment to the minutes to the effect that a war bonus of 2s. per week be granted to Corporation employees, maintaining that the extra cost of £1900 would be saved by the reduction in the cost of street lighting, under the present restrictions. The amendment was defeated by a large majority.

The Special Correspondent of the "Daily Telegraph," cabling from Mitylene, says news from Constantinople states that cargoes of 9000 tons of coal, which succeeded in eluding the Allied Fleet, have reached Constantinople. This has relieved, for a time, the unbearable conditions which were created through the shutting-down, for want of fuel, of the gas-works and all the flour mills. The closing of these works threw the streets of the capital into darkness at night and caused a bread famine.

The Deptford Borough Council have been recommended to have the street lighting reduced by one half, and to approach the South Metropolitan Gas Company with a view to a reduction of charges during the period this arrangement is in operation. The Police authorities originally urged a further diminution of street lighting, and suggested the blackening of the lamp-glasses. The Borough Council Works Committee were, however, of the opinion that the case would be met by the adoption of the above recommendation, which would also meet the Local Government Board's suggestion on the subject of economy in expenditure.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Manager. No. 6095.
Assistant Manager. Grays and Tilbury Gas Company. Applications by Sept. 30.
Works' Fitter. Darlington Gas-Works.
Stoker. Sidmouth Gas-Works.

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Outdoor Superintendent and Collector. No. 6096.
Representative. Charrière, Paris.

Plant, &c. (Second-Hand) Wanted.

Gasholders. "M.F.," care of Messrs. J. G. King and Son.

Meeting.

British Gaslight Company. 11, George Yard, Lombard Street, E.C. Sept. 29. Twelve o'clock.

TENDERS FOR

Cookers.

Edinburgh and Leith Gas Commissioners. Tenders by Sept. 27.

Oxide (Spent).

Salford Gas Department.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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For Information apply to the Secretary, Applied Science Department, The University, St. George's Square, Sheffield.

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EDITORIAL NOTES.

Sharing the Burden—Sliding-Scale Gas Companies.

THE whole nation is involved in a period of unprecedented financial burden, the fullness of which was not by any means disclosed by the budget speech last Tuesday of the Chancellor of the Exchequer, in which he outlined his plans for increased taxation with the view of meeting part of the enormous expenditure occasioned by the war. Heavy as the burden is known to be, heavier still as we anticipate with certainty it will be, the nation will bear it all with the philosophic courage and patience which are essential to the effective consummation of such a cause as that which we, with our Allies, have in hand. The scheme for the reinforcement of the national revenue which Mr. M'Kenna put before the country is generally regarded as being quite equitably based. But, of course, we cannot expect such a far-reaching scheme, although it is spoken of as being equitable, to be perfect under all conditions of the incidence of its various elements. We must swallow the imperfections of incidence, seeing that it is impossible to legislate for each and every condition in a matter of this kind. However, by way of example, we cannot see that the heavy income-tax is altogether quite fair in respect of dividends statutorily regulated, through the operation of a sliding-scale, in relation to the price of gas There is to be an addition of 40 per cent. to the income-tax; but the addition is only to be 20 per cent. for the remainder of this year. As a matter of fact, this is not so heavy as was freely expected in view of the current enormous expenditure of the country. The addition appears to mean that the 20 per cent. in the current year will increase the tax by 3⅗d. in the pound on earned incomes up to £1000, and 6d. on unearned incomes—making the total rate in the pound for 1915-16 respectively 1s. 9⅗d. and 3s.; while for 1916-17 the respective rates will, under the 40 per cent. increase, be 2s. 1⅕d. and 3s. 6d.

Now in respect of unearned incomes, the sliding-scale of price and dividend in connection with gas supply never contemplated such an inordinate condition of things as that which now exists. The sliding-scale is an admirable institution in normal times; but in such days as these, the inflexible operation of the sliding-scale must bear very hardly, especially upon investors of small capital power, who are further hit by the exemption being reduced from £160 to £130, while the maximum abatement is brought down to £120. Gas companies under the sliding-scale are quite different from industrial enterprises that can shift the burden of additional expense entirely on the consumers, so maintaining dividends, and thus putting the shareholders in the position to the more cheerfully pay a heavy tax. But here we have shareholders of gas undertakings seriously injured by a concatenation of circumstances from which they have no means of escape or relief owing to the useful governing laws of normal times, but grievously hard laws in a period such as this, when their need is that the rates of dividend shall be as little affected as possible. Dating especially from the national coal strike of 1912, the price of coal has been mounting up, and superimposed upon this comes the extra price produced by war conditions and opportunists. Reluctantly, most boards of directors have had to put up the price of gas to figures that transfer us to long past days for the local equivalents; and down have fallen dividends to figures of serious nature to people of small incomes and dependant largely, if not wholly, upon their dividends from gas securities. These happenings have brought down the market values of gas shares and stocks to prices that have not had precedent since the slump in the early eighties when the bogey of electric light frightened gas shareholders more than Zeppelin raids do the people of London to-day. From the exiguous dividends there has to be deducted the heavy income-tax. There are dividends to-day that are down to a few shillings over 4 per cent., and after paying income-tax these were last half year returning to the investor under 4 per cent. The investors will be worse off this half year, and worse still in the succeeding one, unless something can be done to give them relief by reducing the price of gas. Truly investors in gas undertakings where there have been heavy advances in the price of gas, are not only sharing the burden, but they are feeling acutely the burden of sharing in a sense that does not obtain in any other industry or business. Though fair and beneficial in ordinary times, the extent of the deprivation of income through the war, from which condition there is no provision whatever for relief by a suspension or partial suspension of the sliding-scale, is not altogether just in comparison with other enterprises working under no restriction as to dividend in relation to the price charged. And the end clearly is not yet. It is true that the Chancellor is contemplating reducing cases of hardship by proposing that, where a person's income is less by one-fifth what it was, he or she shall be relieved of the whole of the 40 per cent. increase; and where the deficiency does not amount to one-fifth, but is more than 10 per cent., there shall be allowance of a proportionate amount of additional duty. But people of small incomes—and we have a large number of them as investors in the gas industry—do not like applying to the clogged, slow-moving machinery provided for considering appeals in respect of income-tax. It is a terrible ordeal; and people often prefer to suffer an injustice in this connection rather than try to obtain redress.

Regarding the tax on war profits, we are confident it will be waste of time applying to the majority of gas undertakings for any return as to excess of profits that has obtained during the war period. What with higher prices of raw materials and increased outlay in other directions, reduced public and shop lighting, domestic economy, and unsaleable pitch, even with increased prices for gas and lower dividends, there are gas undertakings that have been barely able to make both ends meet. There are, however, some gas undertakings whose profits (not dividends) will exceed those on the income-tax assessment for 1914; and, as the tax of 50 per cent. of the excess above £100 is to apply to all trades and businesses, there is another proposal here that, if we appreciate the position correctly, will under the peculiar circumstances operate unfairly. The income-tax assessment for 1914, in the case of gas undertakings, applies to a period of dear coal—a period, too, during part of which coke was a drug in the market, and sulphate of ammonia dropped largely in value. Profits were slender, balances forward were depleted, reserve funds were eaten into—all in the hope that better times would come, and to save, if possible, placing on the consumers the burden of an increase of price. Because of these considerate doings, and because, on raising the price of gas through the compulsion wrought by the war, profits now are in excess of the income-tax assessment for 1914 (though far from being up to the normal), are the gas undertakings to have taken from them 50 per cent. of the excess profits above those of 1914? The coalowners and contractors and shipowners are largely responsible for the condition in which the gas industry finds itself to-day. They will have to pay their share of excess profits. It would serve some of them right if they had to do as labour suggests, pay the full 100 per cent. (or at least 80 per cent.) of the excess. Partially, the position of the gas supply industry is also that of some concerns manufacturing gas plant and appliances; and they could adopt the same argument we have applied to the former in respect of excess profits. Perhaps, however, there will be power of appeal under special circumstances; seeing that a special tribunal (may be it is only to deal with works producing munitions of war) is to be appointed in order to decide upon a fair "datum 'line,'" in all the circumstances. This tribunal, if and when it is appointed, will find plenty of work to engage its attention.

With the lowering of the exemption limit, the inclusion of wage earners in income-tax payment, and the collection of income-tax quarterly from all employees, there is a large amount of approval—with, naturally, exceptions among the persons affected. It can hardly be expected that they would all suddenly fall into line in agreeing that it is right they should share in the financial responsibilities of the present crisis. The Government, too, have taken a correct step in determining that payment of income-tax by wage earners and its collection shall be entirely a matter between the former and the latter. This is better than putting upon employers the responsibility of collecting the tax by deduction from wages. Such a course would only have raised latent animosities and produced no end of trouble. Being a matter between State and worker, if the latter thinks he is not called upon, as a British subject, to contribute to the expanding expenses of the country, he must settle the matter with the State.

It is proposed that the Road Board shall suspend operations, and that the income derived from motor spirit and motor car licence duties shall be retained by the Exchequer, and that an additional 3d. per gallon duty shall be put on motor spirit. The former proposal means that the comparatively small demand for tar that there has been this year for road purposes will be further diminished. We are pleased to see that certain imports are to be taxed; but are not altogether sure that in the best interests of trading at home (from which so much of the country's revenue is derived) the changes that are proposed in the postal, telegraph, and telephone rates—which will probably come into operation on Nov. 1—are correct. But our view has not the support of the knowledge possessed by the inquiries of the Committee on Retrenchment in Public Expenditure. Of course, no one can defend the conduct of a public "trading" department (if so the Post Office can be termed) on a non-paying basis, unless thereby the general interests of the country are promoted. Probably good argument can be advanced both ways here. But our principal concern in connection with the changed fiscal conditions of the country, and the increase of taxation, is the position of the sliding-scale gas companies.

Organization of Scientific and Technical Bodies.

The charge of deficiency in organization in this country is freely admitted to be true. It applies to our scientific and technical resources as well as to other things. The scientific and technical institutions are all so hedged about and individualized that one cannot detect in them any recognition of the fact that they are components of a great system—components which, if they are not doing so, should be ever and definitely aiming at contributing to the general advance and efficiency, both alone and by co-operation with other components. Because there is so much indefiniteness and want of co-ordination of work, so much division, and so little intercommunication, there is not, in connection with the scientific and technical institutions, that degree of efficiency and aggregate result we have a right to expect from their expenditure of time, energy, and money. The accusation as to the want of systematic organization and co-ordination of work has come from various quarters; and several more or less crude notions are abroad as to how improvement could be effected. Some suggest—as has been proposed time after time—individual improvement by internal exertion; others urge that the greatest advance in individual improvement and the production of the best results to the common good could be achieved by the closer union of the various organizations, and a mapping-out of work, so that there is less duplication, and more positive aim, and thus greater economy and efficiency. With such a union, upon the work of each body the advice and practical aid of the men of the learned societies with special talents in particular directions could be brought to bear.

Often the Institution of Gas Engineers has been pointed to as representative of a technical body which seems incapable of getting far out of its ancient rut, and which gives the minimum of result. It is an organization meeting once a year only, and largely dormant during the rest of the twelve months, except when the Council meet, or interest is taken in some topic of current importance to the industry. No one could have the impertinence to hold up the Institution as the standard of what a technical organization should be. It is representative only of the gas profession; and not of the gas industry. Even the technical side is only imperfectly represented by it, owing to the exclusion of the technical men concerned in the design and manufacture of gas plant and appliances. Because of its exclusiveness, the Institution has kept a large amount of technical ability from its doors which would have done much to have raised the efficiency of the body and the value of its technical production. Some of the learned societies are awaking to their deficiencies in organization and result; whether the Institution will do so is doubtful, having regard to the past. Anyway, introspection ought to awaken as to shortcomings, and produce some sense of shame as to poverty of result. The President of the British Association—Professor Schuster—openly confessed, in his recent address, that, while the Association has done good, and rendered excellent national service in a spasmodic sort of way, there has been a looseness and an absence of settled plan about its operations. Current conditions, however, induced him to ask whether the time has not arrived when it may be possible to secure not only a greater continuity of the work of the Association, but its better co-ordination. If the present conditions do not compel every scientific and technical institution to see that it is incumbent upon it to adapt itself to the needs of the times (which means more efficient, and the promotion of larger, service), then the salient lesson of the war will have failed—the lesson that the successful resistance of the enemy so far has been due to complete organization and working for progressive efficiency, while our attempts at breaking down the resistance have been hindered and prolonged indefinitely by our deficiency in organization, though not fortunately the ability to organize.

There is the larger question than this resolve of the British Association or any other scientific or technical institution to mend its ways, and revise its plans so as to render more efficient service in its particular sphere and to the nation generally. This larger question is the co-operation between the many existing scientific and technical bodies, so as to organize and co-ordinate work in a manner that shall yield more profitably. Such a scheme, if properly organized and carried out, should be fruitful. But we cannot help feeling that the difficulties would be great, and as yet the idea is rather vague. For one thing, it does not appear to us that there is any existing organization that is competent to take the headship in this matter, through the lack of a sufficiently broad composition. A tendency exists in some quarters to select the Royal Society as the "top dog" in any scheme to link-up the work of the scientific and technical bodies. Sir Thomas Holland, presiding the other day at a meeting of delegates from corresponding bodies of the British Association, pointed to the voluntary formation of innumerable societies with overlapping functions, yet no cohesion, and no apparent common aim—societies which in a limited way work out their own lives and course of action, without any consideration as to whether or not they have within their ranks all that would be helpful to them, and all the talent that is required to attain a high efficiency. The result of an ungoverned individuality, Sir Thomas holds in effect, represents a loss of power, due to an undesirable number of wheels in our machine, and an unnecessary duplication of effort owing to want of method in organization. He is one of those who suggest that co-ordination should be effected under the Royal Society, and that State aid should be rendered. The Board of Education scheme for the promotion of systematic scientific and industrial research [*ante*, pp. 232, 255], under a Research Committee, with an Advisory Council composed of men of special qualification, also contemplates that the Advisory Committee shall act with (named) the Royal Society and (unnamed) other scientific and technical bodies in formulating work, and in obviating unprofitable overlapping between institutions and persons engaged in research. This all shows a decidedly growing view that something could, and should, be done to bring about the better organization of our scientific and technical institutions, so as to secure larger and more valuable product. A greater interlinking of work was also a point in Professor Bone's masterly address to Section B of the British Association, as published and commented upon in the "Journal" a fortnight ago. He indicated how much the country is losing by the uneconomical use to which fuel is largely put to-day, and urged greater united activity between engineers, chemists, and physicists in suppressing the waste that is proceeding. In this one economic subject, there are problems incalculable for solution, if there were better organization of scientists and technicians.

Admitting that the individual organizations require to set their houses in order, and to better organize so as to attain greater economy and efficiency; admitting, too, that collective organization of the scientific and technical units under a central and principal body would be of advantage to efficiency and progress—the question arises, Is the Royal Society the best body for this purpose? While holding the members of the Society in the highest respect, we have our doubts. The members of the Society are the optimates of the scientific world; but they are not, taken as a whole, in the necessary direct touch with industry to enable them to render the most practical aid by being placed in chief position in any organization of, and co-operative effort by, the scientific and technical institutions. A specially constituted central authority with representation drawn from all quarters would, in our opinion, be much more effective and efficient—such a central organization, State-aided, as Mr. Charles Carpenter, D.Sc., adumbrated in his paper before the Society of Chemical Industry in July last [*ante*, pp. 115, 130], which central authority would keep in touch with technical progress and requirements through the media of the associated institutes throughout the land. Under this scheme, each industry would have its own institute of technology not only to provide training for workers, but with fully equipped resources, so that problems of all kinds in connection with the industry could be submitted to the specialized establishments for research. The organizations associated with each industry have special work to do; and if the now current ideas germinate, and a scheme of collective organization and co-ordination of work be adopted, nothing whatever must be done to destroy the advantages of individuality and specialization. Whatever the plans, they must be initially directed to the development of the existing scientific and technical bodies and their work. To this end—if the greatest good is to be attained—every care would have to be exercised in selecting the central body; for its ability to supervise and direct would depend upon the breadth of competence in its composition.

Fixing a Gas-Standard.

Of the group of papers of which abstracts are published by us to-day, and which are occupying the attention of the members attending the International Gas Congress at San Francisco, we may easily award the palm for current interest and value to the one prepared by Mr. R. S. M'Bride, Associate Chemist, Bureau of Standards, Washington. The subject of the paper is "Substituting Heating Value for "Candle Power as a Standard." The author discusses frankly and freely the considerations he submits should be taken into account in deciding upon the standard and the test to be adopted in connection with gas supply to-day. In our opinion, he goes unnecessarily far in bringing within the bounds of essential consideration some of the minor factors; but, on the other hand, we feel persuaded, by the character of his contribution, that Mr. M'Bride has not so engirded himself with considerations immediate and remote that his mind is closed to conviction that the considerations he advances are, taken as a whole, really a counsel of perfection, and somewhat beyond the needs.

When among the fundamental principles relating to the fixing of the standard of quality, Mr. M'Bride lays it down that it must be a real measure of the usefulness of the gas for the principal purposes to which it is put, he cannot do other than conclude that calorific value is the only possible standard, and that the illuminating power one must go. Having come to this conclusion, the more troublesome matter is to decide what shall be the numerical extent of the standard in British thermal units. We are afraid there must be confession that in this matter (though there is not now really much about which to complain) our British legislators have laid down the standard here in a somewhat arbitrary fashion; the line taken being the crude one of determining what has been the approximate calorific power of gas supplied in two or three representative districts under the illuminating power standard of 14 candles. The question as to the numerical standard being fixed with an eye to the community of interest as between consumers and suppliers, or any economic considerations which would be to the advantage of consumers and undertaking—such as the calorific quality of the gas to be obtained under the local circumstances of coal supply and plant—have never entered the heads of our legislators. Yet (we repeat) there is fortunately little about which to complain in respect of the calorific standard now commonly applied by Parliament. It is only right that the standard should be such as to permit choice of the most economical plant and the use of the most economical of the nearest available coals, and so as to admit of the making of the quality of coke, &c., best suited to the local markets. But we do not think anyone could go so far as to consider the depreciated value of plant as a factor in influencing gas quality requirements; it is a duty on gas suppliers to maintain the efficiency of their plant so as to produce the statutory quality. If temperature, pressure, and friction losses were all taken into account, the labour of calorific standard-fixing would be a never-ending one.

Further, it certainly does not appear to us, under the conditions and experiences here, that it is necessary to fix any standard to apply to gas reaching the consumers' premises, because this would necessitate considerable labour in testing. Mr. M'Bride holds that, while tests made at the gas-works are of value, they do not serve to detect deficiency in quality resulting from loss of heating value in the course of supply, because of improper operation during the condensing of the gas. Earlier in the paper, he says that it has been found that changes in heating value of the gas which occur are a much smaller percentage of the total than the loss in candle power that happens simultaneously. This shows that the constituents contributing largely to calorific power have a greater stability than the hydrocarbons contributing largely to illuminating power. This being so, if tests are made on each of the trunk mains leading from a works, there is quite sufficient assurance as to the requisite calorific value reaching the consumers. But Mr. M'Bride does not appear to suggest continuous tests at distant parts of the district of supply, but only tests from "time to time" in order to determine whether or not the calorific quality of the gas has deteriorated unduly *en route* to the consumers. There can be little value in this, seeing that all the evidence points to slight deterioration; and, if there were unusual deterioration, it might not happen to be at the times when the intermittent tests were made.

We may take an early opportunity of referring to two or three other aspects of this interesting paper.

Gas Heating and Air Pollution.

A short time since we were favoured with a copy of the first report of the City of Manchester Air Pollution Advisory Board, consisting of members of the Corporation Committees and gentlemen associated with local scientific and technical bodies, all of whom are working in collaboration with the Sanitary Committee of the Corporation. The object of the Board is, by propaganda and the results of investigation, to make a healthy impression on the smoke trouble; and this is an object of economic and health promoting importance. The report satisfies us that the Board are working on beneficial lines; and we fully recognize the value of what is being done by them not only in relation to Manchester, but because the example they are setting will, in all likelihood, be copied by other prominent cities and towns. But there is one warning we would give the Board. It is that they must not imagine, so far as the use of gas is concerned both in domestic and industrial operations, that there has been no prior investigation. As a matter of fact, there has been so much good research work that there is a fairly extensive knowledge available as to the scientific aspects of the employment of gaseous fuel. Seeing that gas cooking stoves, gas-fires, gas apparatus for providing hot water, gas-heated furnaces, and other appliances in use in the United Kingdom total to millions, and that improvement in these various applications to domestic and industrial purposes has been produced by scientific research and practical experience, it would be well for the Board to investigate first what has been done in these directions before setting out to traverse anew the long road of past competent and unimpeachable research.

Prompting this warning are the remarks that Mr. E. D. Simon, the Chairman of the Manchester Air Pollution Advisory Board, made [*ante*, p. 572] when air pollution was under discussion at the meeting of Section B of the British Association, over which section fortunately Professor W. A. Bone, D.Sc., F.R.S., was presiding. Among the investigations the Board are making are as to improved means for reducing both factory smoke and domestic smoke. It is a thousand pities that whatever work is needed in this direction is not undertaken nationally—say, through the Departmental Committee on Smoke Prevention—instead of locally, so as to prevent all that repetition work which comes from the appointment of many bodies to cover the same objects, so producing uneconomy, inefficiency, and complication. It was against this sort of thing that there was strong protest in some of the principal addresses delivered during the meeting of the Association. However, this is a matter that is coming to the front in connection with the new-born recognition of the need for better organization of our national scientific and technical resources. Mr. Simon's remarks were directed chiefly to that most difficult of all problems in connection with the smoke trouble—domestic heating. He regards as a hopeful line of work (as many have done before him, only to be disappointed by the result and the financial loss) the promotion of the use of part-carbonized coal, from which valuable products and a considerable proportion of the volatile matter have been removed; and there is the adaptation, too, of the open grate for burning gas coke. But he admits that most important of all is the use of gas-fires and other gas-heated appliances.

This admission brings us to the point where, as Chairman of the Air Pollution Advisory Board, Mr. Simon indicates that he is not sufficiently acquainted with the work that has been done with gas-fires and other gas-heated appliances, and with what to those living outside the industry is the amazing popularity which such fires and appliances in their modern state have already attained. He asserts that much remains to be done before gas-fires are procurable which will give out radiant and convected heat in the best proportions, which will not allow leakage of "gas" into the rooms where they are being used, and which will afford the right amount of draught up the chimney. It must be confessed that we are at a total loss to understand what Mr. Simon means by the assertion. Tests made at the Leeds University and elsewhere show conclusively that the proportions of radiant and convected heat, and of the waste heat which promotes chimney up-draught and ventilation, are such that any variation that may be made in the future will be on a relatively small scale compared with what has been done in the past. This was indicated by Mr. H. James Yates's remarks [*ante*, p. 586] on the same occasion, although there was no admission by him, nor is there by us, that the end of gas-fire advance has already been realized. As to the leakage of "gas" (it is assumed that products of combustion are intended), the "Lancet" laboratory tests show that escaping products of combustion are things of the past with modern types of fires of recognized makers.

There is another point in relation to which Mr. Simon, as Chairman of the Manchester Advisory Board, does not appear to have been sufficiently informed. He states that promising attempts are being made to devise a standard method of measuring the total radiant heat of a fire. A standard method is already in existence; and what has been done has been to propose what are declared to be improvements upon this standard method. Of course, it may be that the Board are working independently, and are hoping to propose something off their own bat; but this can hardly be the case. However, Mr. Simon is hopeful that, with a standard system for testing radiant heat efficiency, the Board will be able to give independent and authoritative advice as to the best types of heating appliances to instal under any given conditions, having regard to questions of gas heating and ventilating effect. This can now be done if the Board chose to take up such work; but it would be rather a big undertaking for voluntary effort.

However, a valuable line of work which the Board could readily enter upon would be to try to bring the Manchester Corporation to their senses in regard to gas profit appropriations in relief of the rates. Mr. Yates showed that, by the improvements in gas-heating appliances which have been made, the solution of the problem of domestic heating is within measurable distance. What stands between the complete conversion of the domestic hearth from coal to gaseous fuel? There is nothing to-day, save custom and the cost of gas. We are in difficult times now in regard to the price of coal; and the cost of gas is temporarily increased. But in normal times gas should be sold as low as possible; and nothing should be done in abnormal times to exact from the consumers of municipally produced gas, profits beyond what are necessary for the purposes of the undertaking in order that large sums may be devoted to the relief of the rates. To at any time take profits from gas consumers so that the rates may be relieved, is an injustice; to take profits when things are in the extraordinary condition of the present, is a gross injustice. Professor Bone did not mince words in characterizing what the Manchester Corporation are doing. It is a "pernicious and senseless" custom, he said, to relieve the "rates out of the profits." Mr. J. G. Newbigging, in a paper he read before Section G [*ante*, p. 588], said he thought the injurious effect of the policy is not fully realized. It is cheap gas that is wanted for the highly efficient fires the makers have produced. It is an absurd and uneconomical thing to take £50,000 per annum from the gas consumers to relieve the rates, while an immeasurably greater injury is being done to property and health by smoke, and 10 per cent. of the sunlight is being screened from the people of Manchester by the same cause. The balance of this particular account is certainly on the wrong side. Cheaper gas would really mean a larger adoption of gas-fires; the larger the adoption of gas-fires, the smaller the volume of smoke sent into the atmosphere.

Efficient Service in Production

The British gas industry feels honoured that certain of its representative men were invited to prepare for, and contribute to, the Gas Congress in San Francisco papers delineating present practices in the manufacture and distribution of gas by the gas undertakings in this country. Abstracts of their contributions are to hand; but it will be roundly regretted that the forepart of manufacture is unrepresented by them. The primary cause for this is the lamented death of Mr. Edward Allen. Mr. John Bond is also under obligation to contribute to this section; but an abstract of his part of the work is not included. We hope this merely means that there has been some delay in completing the contribution. Dr. W. B. Davidson, however, describes British practice in the condensing, washing, and scrubbing of gas. There is not much in regard to developments in condensing for him to relate; and in washing and scrubbing, though there have been advances, there is really no recent innovation to describe that has commanded any large adoption. The practices are now fairly common and general. The purification of gas is treated by Mr. J. Ferguson Bell; and he has a very good tale to narrate as to the practices that represent low cost purification in this country, and, not only so, a feature is the high sulphur compounds purification efficiency of the catalytic method perfected at the works of the South Metropolitan Gas Company.

And Distribution and Supply.

Carrying forward the tale to the distribution system, Mr. Walter Hole tells of the changes in distribution that have been necessitated by extended areas and the growth of application of gas in industries and in the home. The only method that presents itself to his mind for meeting the varied demands with the utmost efficiency is to maintain the highest requisite pressure, and to govern-down on the consumers' services. To resist the tendency to increased leakage under the pressure necessities of the time, it is imperative that the distribution plant should be systematically improved and made gas tight. He recognizes the considerable capital expenditure that would be needed to provide ideal conditions in respect of individual governing; but, if the industry is to make the best of itself, we have to bow to the inevitable in regard to new conditions. There are introduced, by the way, several personal experiences regarding individual points. High-pressure supply has now acquired an indispensable place in our practices, and has enabled progress to be made that would otherwise have been impossible. All this indicates the necessity of working to provide adequate supply to the whole body of the consumers. Mr. F. W. Goodenough, in a succeeding contribution, on practices in the sale of gas, puts adequate and constant supply forward as the premier essential, the second being efficient appliances, and the third their maintenance in a good state of efficiency. Much else makes up a good story; but from condensing to sale, there is one objective, and that is "Efficient Service."

Mr. Newbigging—Revolutionist.

Adverting to our editorial of last week with this heading, what we then anticipated has happened. "Meteor" of the "Electrical Times" finds that Mr. Newbigging "throws up the sponge on behalf of gas as a lighting agent." "Gas is compelled not only to yield ground to electricity, but also to shorten its line of trenches." Mr. Newbigging would like to see "the light business handed over to the Electricity Department, leaving the Gas Department a monopoly of gaseous fuel supply." "Meteor," however, doubts whether electricity is "in the mood for any bargaining. Nothing less than victory all along the line will satisfy those who have for three decades fought an uphill fight, and have never hitherto received quarter or even the courtesies of civilized warfare from the enemy. There are such things as electric-fires and electric-cookers. They will do for the gas-stove what the motor has done to the gas-engine, and the electric lamp is doing to the gas-mantle." So speaks the prophet, who has prophesied often with, for him, painfully bad luck. Under the shelter of the wing of Mr. Newbigging, he forgets that the gas industry is a very large thing, and his protector only a unit of its extensive *personnel*. The three decades of uphill fighting of the electricity industry show the tremendous difficulties of the problems it has had to face; and they are not all solved yet. The "courtesies of civilized warfare" are well exemplified by the defamation by the electricity industry of gas owing to its strength and the slowness of the advance made by electricity in general supply. The latter part of the quotation consists of empty words, which are easily crushed by the facts supplied by the Board of Trade returns and the demonstrable capacities and economies of gas appliances. The gas industry is quite prepared to fight without making any compact as to the limitations of business operations. Mr. Newbigging (who was, in his paper, speaking for himself, and not for the gas industry) has sent for publication a letter on the subject of his attitude. It appears to-day in our "Correspondence" columns.

Retrenchment.

The Committee on Retrenchment in Public Expenditure (who have for their Chairman Mr. R. M'Kenna) some days ago issued a first report, certain conclusions of which were reflected in last week's War Budget. With the object of ascertaining what savings could, in view of the necessities created by the war, be effected in the Civil Departments without detriment to the interests of the State, the Committee have already taken evidence from a number of the large Departments, including the Post Office, and from representatives of the London County Council. Taking the Post Office first, as being the Department financial alterations in which may be expected to most widely affect the public, the Committee make recommendations which have to a large extent been adopted in the Budget, and are already being discussed throughout the country. In another direction, the Committee have been much impressed by the expenditure upon Blue-Books, Parliamentary Returns, and certain other publications. It seems that the cost of printing alone amounts to about £40,000 a year for papers presented to Parliament [excluding the various departmental publications]; and it can be easily understood that "the cost of collecting and compiling the materials must be very much larger." The sales are admitted to be usually negligible; and the Committee feel that in some cases the original demand for the information supplied has now ceased, and the publications could be dispensed with. They recommend therefore that Government Departments should carefully review all the reports returns, and publications hitherto presented to Parliament or published, with a view to the permanent discontinuance of any which are no longer of sufficient importance to justify the money spent on compilation and printing; to the temporary discontinuance for the period of the war of any which, though necessary in normal times, can be dispensed with temporarily without grave risk or inconvenience; and to the permanent curtailment of the length of all publications by excluding those portions which are not absolutely necessary, or which are required for departmental use only, and need not therefore be printed. It will be interesting to have a list of the publications which it may be decided to deal with in any of these ways. Economy in coal and lights by the various departments in the coming winter is enjoined; and the Committee also make reference to the work of the Road Board, the expenditure of local authorities, and various other matters.

How to Reduce Gas Bills.

Occasionally hints which are more mischievous than practical appear in the Daily Press, advising gas consumers how they may save money on their gas bills. Such an article was published a few days since in the "Evening News." It purported to have been written by a gas user. His expedient for saving from 5s. to 15s. per gas bill is simple but misleading, and therefore is not ingenious. It is suggested that the meter-cock handle should be turned until it is in the position in which the passing supply of gas will keep the burners fully alight. This position, the writer says, is generally midway between 45° and 60° to the position of the meter cock when closed. He also suggests the alteration of the stop-pin in the barrel of the gas-tap, so that this can never be turned more than three-quarters on, this being declared to be about correct if the meter-tap is rightly positioned. But a sharp eye has to be kept on the meter-inspector. He seems to be an individual who looks after his master's business, and not the consumers' interests. After he has called, and done his nefarious piece of work of turning the meter-tap on full, the consumer should go and replace the "handle" in the economizing position. Those inspectors are an artful lot of men; and the consumer must be equally cute. The senseless thing about the whole business is that a check to the pressure and flow of gas as suggested, when there is a good number and variety of consuming points about a house—burners, cooker, fires, &c.—means loss of efficiency of the appliances, and loss of efficiency spells uneconomy and not economy. If the pressure and flow of gas are checked at the meter as suggested, they cannot be suitable for all purposes—whether one gas-jet is being used or several; the latter including perhaps the cooker and the fire. There are other ways of saving gas than as suggested by the "Evening News." We would rather have full efficiency at one burner than inefficiency at two.

PERSONAL.

The Directors of the South Bank and Normanby Gaslight and Coke Company, Limited, have selected Mr. SAMUEL SHADBOLT, Engineer, Manager, and Secretary to the Fleetwood Gas Company, from a number of candidates, for the position of Engineer, Manager, and Secretary to their undertaking. Mr. Shadbolt has been at Fleetwood since February, 1910, following on the sudden death of his father, who had spent 32 years in the service of the Company. Previous to this, he had been for five years at Kirkby-in-Ashfield, had been in charge of the gas-works at Biggleswade for three years, and had received earlier training as Assistant first at Fleetwood and then for a short period at Grantham. During his management at Fleetwood, he has secured parliamentary powers for the Company, against strenuous attempts to force a purchase clause, and has overhauled and remodelled the works.

The Fleetwood Gas Company have appointed as Engineer, Manager, and Secretary to their works, in succession to Mr. Samuel Shadbolt, Mr. WALTER SHADBOLT, at present Manager and Engineer to the Llandudno Urban District Council Gas Department. Mr. Walter Shadbolt has been at Llandudno for over 8 years, and during this time has carried out considerable alterations and extensions on the gas-works there; while the output has risen from 70 to 115 million cubic feet. This increase is largely attributable to Mr. Shadbolt's successful development of the trade in gas for cooking and heating; the number of stoves, fires, &c., in use having been more than doubled under his management. In his early days, Mr. Walter Shadbolt was also trained by his late father on the Fleetwood works—from 1892 to 1896—following which he was Assistant to Mr. J. B. Fenwick, the Gas and Water Engineer to the East Retford Corporation. In 1899 he assumed the duties of Assistant to his elder brother, Mr. R. G. Shadbolt, of Grantham, during a time which covered extensive alterations at the Grantham works, and also a sixteen months' period of service to King and country in the Active Service Company of the old Lincolnshire Volunteers during the South African war. In 1904 he accepted the appointment of Engineer and Manager to the Horncastle Urban District Council Gas Department, where he modernized the retort-house, installed new sulphate of ammonia plant, and was highly complimented by the Local Government Board Auditor on the successful manner in which he re-organized and consolidated the financial affairs of the undertaking.

Two interesting circumstances of a personal character marked the half-yearly meeting of the Torquay Gas Company [which is referred to on another page]. The presence of Captain JOHN KITSON in the chair was a matter of gratification to the shareholders, who are naturally proud of the fact that an example in patriotism should have been set by the head of the Company, and were pleased to welcome him on a brief return from military duty. Like other companies, that at Torquay has contributed many members of the staff to the forces, with the result that those who remain to carry on the business have had exceptional calls made upon them. On the Board, the place of the Chairman is temporarily occupied by Mr. Iredale, who has long filled the position of Deputy-Chairman, and possesses an intimate knowledge of the Company's affairs. The other personal circumstances which formed a subject for congratulation at the meeting was the fact that Mr. ROBERT BEYNON (the Manager) has just completed thirty years' service with the Company, while his colleague Mr. J. DUCKWORTH (the Accountant) has twenty-one years' service to his credit. The Directors, by formal resolution, have expressed their sense of the long and faithful service of these two officers; and the shareholders heartily concurred in it.

COKE-OVEN MANAGERS' ASSOCIATION.

Inaugural Meeting at Sheffield.

Some months ago it was suggested by a few coke-oven managers round about Sheffield that an Association of Coke-Oven Managers be formed in the district, and a Provisional Committee was appointed to consider suggestions, and to formulate a scheme or constitution. Notice of the meeting appeared in the Technical Press, and there was a fairly satisfactory response from coke-oven managers in the South Yorkshire district. A further meeting was held at the Grand Hotel, Sheffield, on Saturday last—Mr. G. Chrisp, of Silverwood, occupying the chair.

The object of the meeting was to consider the proposals of the Provisional Committee with regard to the constitution and formation of the Association. Unfortunately, there was not a very large attendance. A set of rules was put forward by the Committee, based on the rules of similar associations; and after some little discussion, these were adopted *en bloc*. The Association is to consist of three classes of members: (1) Full members, who must be coke-oven managers. (2) Associate members, who must be assistant managers or chemists over 21 years of age. (3) Honorary members, who must be gentlemen of distinction in connection with the industry of bye-product coking.

The annual subscription for members is one guinea; and for associate members, half-a-guinea. The Secretary is Mr. J. T. Price, of Manvers Main, near Barnsley, to whom applications for membership may be made. The Committee were empowered to draw up a syllabus of meetings, &c., for the ensuing year, and this will be published in due course.

NORWEGIAN GAS ASSOCIATION.

Writing from Christiania, under date Sept. 15, Mr. J. G. Tooms—late of Waterford, and who has recently taken up a position in connection with the new gas-works to be erected in the capital of Norway—gives some particulars regarding a three days' meeting (on Sept. 14, 15, and 16) of the Norwegian Gas Association, held under the presidency of Mr. O. Pihl, the Director of the Christiania Gas-Works. There was a full attendance of members.

The annual report disclosed the fact that the number of undertakings represented by the members is the same as last year—six being municipal. The consumption of gas had increased by 14·8 per cent. The consumption per head of the population, which in 1907 was only 41 cubic metres and 66·3 cubic metres last year, is now 74 cubic metres. The number of gas consumers in 1905 was 18,500; in 1914, 61,704; and at present, 68,076—showing 13 per cent. increase for the year. These figures are, Mr. Tooms writes, somewhat remarkable, in view of the cheap electricity available throughout Norway, generated by water power.

The papers read and submitted for discussion were as follows:

"The Difficulties attending the Choice of a Site for, and Description of, the Proposed New Christiania Works." By A. Ekenaes.
"Direct Recovery of Ammonia." By B. Schieldrop.
"Municipal Coal Dealing." By K. Helgeby.
"Results of Heating Sandefjord Church." By A. Hertz.

A lecture, illustrated by diagrams, entitled "Coal—its Locations, Properties, and Utilization," was delivered by Mr. Pihl, which dealt with the supply available from all parts of the world.

A report was submitted by Mr. A. Hertz, on behalf of a Committee appointed last year to consider the adoption of a standard type of consumers' apparatus. It appears that the type of cooker finding most favour is one called the "Express," manufactured in Denmark.

The Association were entertained to dinner by the Kristianie Kommune, on the last night of the meeting.

HEAD OFFICE FOR THE GAS, WATER, AND ELECTRICITY WORKS OF BELGIUM.

A decree dated July 26 last, signed by Baron von Bissing, the German Governor-General in Belgium, creates a head office in Brussels for the Belgian gas, water, and electricity works. The decree is published in the "Journal für Gasbeleuchtung" of the 11th inst., with a statement that it is intended to effect closer co-operation of these works in regard to the supply of coal, the disposal of bye-products, &c. Herr Drape, formerly Manager of the Lüneburg Gas-Works, has been put in charge of the office, and also appointed Manager of the works to which coercive measures are being applied. It will be remembered that as soon as the German army had occupied a considerable portion of Belgium, Herr Drape was given general supervision over the gas, water, and electricity works in the occupied area.

The decree comprises six sections. The first states that the head office in Brussels has been created for the supervision of the gas, water, and electricity works and matters relating to them. The second that the works are required to place their products, wholly or partially as ordered, at the disposal of the head office for working-up or sale; and that the receipts will be credited to the owners. Plant which the head office deems necessary for working-up the products must be installed and operated in connection with existing plant on the works; and no claim for compensation in respect of the erection of such plant can be promulgated. The works are to follow instructions from the head office in regard to all such plant. The third section states that it is forbidden to carry out contracts relating to the products of gas, water, and electricity works which are contrary to orders issued by the head office. The fourth section enacts that no claim for damages, &c., can be promulgated in respect of breach of such contracts. The fifth section states that any member of the board, manager, or officer of an undertaking who wilfully acts in opposition to the first three sections, and more especially anyone who endeavours to deal with products otherwise than provided by the second section, will be liable to a fine not exceeding 10,000 francs (£400), to be imposed by the military, and to recovery of the proceeds or their equivalent. The sixth section states that the decree came into force at once—*i.e.*, on July 26 last.

SIXTY YEARS AGO.

From the "Journal" for Sept 10, 1855.

Liverpool Gas Inquiry.—Most of our readers will recollect that, previous to the year 1847, two gas companies in active competition occupied with their pipes almost every street in Liverpool. In that year a third company was projected to share with them the profitable trade they were carrying on; for, though competitors for custom, the price charged by both companies was uniform, and the profits were sufficiently tempting to induce the belief that there was room for a third establishment. The Town Council, however, recoiled from the responsibility of having the pavements disturbed by the introduction of a third set of gas-mains; and under their sanction a Committee of the House of Commons suggested terms upon which an amalgamation of the two existing companies should take place, and from which it was expected the public would derive all the advantages the introduction of a third company could possibly confer, without any of its disadvantages. In 1848, an Act was obtained sanctioning the suggestions of the Committee of the previous year; and since then the public have been supplied with gas extracted exclusively from Wigan cannel, at the price of 4s. 6d. per 1000 cubic feet, until Christmas last, when a reduction took place to 4s.; the Company having divided the full dividend allowed by their Act, and accumulated the authorized reserve fund. During this period, however, a party has sprung up in the Town Council, among which are some of its most active and influential members, who are desirous of seeing the gas as well as the water supply invested in the hands of the Corporation, as practised in Manchester; and the inquiry now in progress [this refers to the proceedings of a Committee appointed by the Town Council of Liverpool to inquire into the state of the gas supply.] appears to have been instituted with the view of aiding the realization of such a scheme, though, as a matter of course, when such an investigation is once begun, the door is opened to the consideration of any project for promoting private interests, under the pretext of suggesting measures having for their object the improving of the supply of gas or reducing its cost. Thus, while Mr. Robertson Gladstone and his friends are desirous of eliciting information which may tend to show the advantages of the Manchester system, Mr. Reay and his coadjutor, Mr. Flintoff, are intent on the formation of a new gas company, which will ensure to them "permanent" berths; and Mr. Taunton, availing himself of the imprudence of some of the Liverpool gas consumers in overfilling their meters with water, finds a panacea for all their wrongs in the substitution of good dry meters. . . . It is difficult to conceive how an inquiry conducted with such discordant views can produce any satisfactory results. The Gas Company have long since intimated officially their consent to the appointment by the Corporation of a public officer to test meters; and they have instructed the Borough Engineer how to determine with the greatest accuracy the illuminating power of the gas. Their officers attended the Committee, and professed their readiness to meet all the charges which could be brought against them, as soon as they were acquainted with their nature; but, when speculative opinions were sought for from those who had no practical experience upon which to base them, it became evident that the inquiry was not a *bonâ-fide* one into abuses, but an attempt to create an agitation for the furtherance of rival projects. Under these circumstances, the Gas Company had no alternative but to retire from the investigation.

North of England Gas Managers' Association.

The half-yearly meeting of the Association will be held next Saturday at Newcastle-on-Tyne. The members will assemble at the Elswick Gas-Works for the inspection of the new plant, including an installation of vertical retorts. Subsequently, there will be a business meeting in the lecture theatre of the Institute of Mining and Mechanical Engineers, when the President (Mr. Thomas Waddom) will deliver his address, to be followed by a paper on "Some Considerations as to the Calorific Value and Calorific Standards," by Mr. J. T. Dunn, D.Sc., and a paper on "Home Sales of Sulphate of Ammonia," by Mr. A. G. Leighton, of the Sulphate of Ammonia Association.

THE MANTLE EARTHS.*

The lecture by Mr. Edmund White, F.I.C., on "Thorium and its Compounds," which was published at the close of 1912 as one of the series of reprints of lectures on different branches of technical chemistry issued by the Institute of Chemistry, is unsurpassed as a short monograph on the extraction of the mantle earths from monazite and other minerals, and on the analysis and assay of the commercial thorium compounds. Mr. White's exceptional knowledge of the industry of the mantle earths rendered his work unusually valuable; and so far as the analytical and technical aspects of the industry are concerned, his lecture seems likely to remain the best guide available in the English language. Perhaps sometime he may see his way to dealing more fully with the subject by preparing a concise handbook on it.

Mr. White, however, only touched lightly on possible sources of thorium other than Brazilian monazite; and a paper which Mr. Sydney J. Johnstone read last year before a meeting of the Society of Chemical Society constituted a valuable supplement in this direction to Mr. White's lecture. Mr. Johnstone gave in his paper the results of examinations of monazites from several new localities, including Travancore, which has recently come into great prominence. Mr. Johnstone has now collected this information; and with additional analyses, and a summary of the processes of mantle manufacture, has produced a very useful chapter of thirty-three pages on the "Thorium and Cerium Industry." It forms the first of the nine chapters which go to make up the manual by him and Dr. A. S. Russell on the Rare Earth Industry and the Industry of Radioactive Substances which is now before us. The ninth chapter refers to the radioactive substances, and the second to the eighth chapters inclusive treat of titanium, zirconium, tantalum and niobium, tungsten, the "incandescent electric glow lamp industry," uranium and vanadium. It is obvious, therefore, that only the first chapter deals with the mantle earths which are of direct importance to the gas industry—nearly all the remaining chapters merely interest the gas man from their bearing on the rival system of indoor lighting, which, with a tautology we do not remember to have noticed elsewhere, Mr. Johnstone calls the "*incandescent* electric *glow* lamp" [the italics are ours].

The book as a whole will probably appeal more strongly to people seeking information about the metallic filament lamp industry than to persons taking an interest in gas-mantle production. A work on either subject is, however, certain of a welcome at the present time, when home manufacture is replacing importation to a very large extent. It depends on the technical knowledge and ability of our manufacturers and their chemical and physical advisers whether this replacement endures, or whether, when international relations are restored, there is a reversion to the old condition of our dependence upon other countries for an adequate supply of mantles and glow-lamps or the essential materials for their manufacture. In so far as Mr. Johnstone's work may assist in extending the technical resources and knowledge of English mantle and electric lamp makers, we wish every success to his efforts. He has carried out his task very conscientiously and judiciously, and slips in the little volume are rare. Perhaps the worst is the statement on p. 79, that "the Hefner candle power is equal to about 1·13 British standard candles," whereas, as readers of the "JOURNAL" know well, the accepted ratio is, one Hefner is equal to 0·9 British standard candle. A minor point is that researches made by Dr. H. Lux, the well-known Editor of the "Zeitschrift für Beleuchtungswesen," are wrongly attributed to a Herr J. Lux.

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* "The Rare Earth Industry, including the Manufacture of Incandescent Mantles, Pyrophoric Alloys, and Electrical Glow Lamps," by Sydney J. Johnstone, B.Sc. (London), Senior Assistant, Scientific and Technical Department, Imperial Institute, London; together with a Chapter on "The Industry of Radioactive Substances" by Alexander S. Russell, M.A., D.Sc., late Carnegie Research Fellow, and 1851 Exhibition Scholar of the University of Glasgow. London: Crosby Lockwood and Son; 1915.

Export of Monazite Sand from India.—A notification issued by the Indian Department of Commerce and Industry prohibits the export of monazite sand from British India to all ports in Europe and on the Mediterranean and Black Seas, other than those of the United Kingdom, France, Italy, Russia (except Baltic ports), Spain, and Portugal. The provisions of the notification are, however, not applicable to goods shipped by, or for the use of, the Crown.

Northampton Polytechnic Institute.—Notwithstanding the disturbance caused by the war, the equipment of the various departments at the Institute was in several directions extended during last session; and the programme of work for the new session indicates generally that it has been decided to continue the different regular classes which have hitherto been a feature of the work done. There are day and evening engineering courses—the civil, mechanical, and electrical branches being included—and technical chemistry is another subject dealt with. In connection with the evening classes in engineering, however, the Principal (Dr. R. Mullineux Walmsley) states that it has been found impossible to arrange for special series of advanced lectures, as the possible lecturers who have been approached are engaged in work directly or indirectly concerned with the war.

ELECTRICITY SUPPLY MEMORANDA.

Economy Everywhere.

The electricity industry is not in very happy mood. The expenditure of money on new electricity schemes and generating plant extensions, in consonance with the general policy, is being discouraged by the Treasury and the Local Government Board, unless the outlay is absolutely necessary for the provision of electrical energy for establishments engaged on Government work; but the plea that this is the specific purpose for which money is required will not much longer hold good, seeing that factories engaged on the production of munitions are now working "full bore," and so are supplied with all the electrical energy needed. It is only the new enlistments of factories that will probably seek assistance. On top of this, the Local Government Board have notified municipal concerns that no money must be spent on extensions of mains or new services other than for firms employed on war work. Consequently, electrical contractors do not like the appearance of things. They are paying higher wages; taxes on profits are greater; and the scope for business is very limited. Even the present electricity consumers will not contemplate the spending of money on new electrical goods, which are at ordinary times expensive in contrast with gas appliances, and are much more so now. Shopkeepers and householders smile quite good naturedly at the essays to tempt them; but they give a decidedly negative shake of the head. The expenses of electricity concerns, like those of gas undertakings, have advanced all round—not only for coal, but in other ways; and business has diminished considerably through reduced shop lighting, street lighting, and the economies of householders. The advantage possessed by the switch is not a neglected one to-day. In the circumstances, most concerns have raised the price of current. They could no more help doing this than gas undertakings their commodity. Coal has gone up considerably in price, compared with a few years ago. The standard increase of 4s. is only part of the higher figure paid in contrast with days when pre-war tariffs for electricity were fixed. For example, one chairman of a municipal electricity undertaking states that 21s. 4½d. is now being paid by the department for fuel similar to, and no better than, what was being purchased for 8s. 7d. only eight years ago. On top of this, the concerns have to carry larger stocks, and these of the more expensive coals, which also means increased outlay. The Board of Trade have very properly circularized the undertakings urging them to put greater quantities of coal into store, owing to anticipated difficulties during the next winter. The higher expenses for fuel only constitute one of several enhanced charges. Materials and labour all cost more. Charges for electricity have generally gone up by so much per unit, or, what is a popular method, by adding 10 per cent. to the accounts of consumers. In the case of some undertakings, 20 per cent. has been added to the charges for power, cooking, and heating. If the tariffs for these three purposes were fair before the war, then why is not 10 per cent. an adequate addition as in the case of lighting? It is not necessary to search about for an answer.

Extra Street Lighting Reductions.

After the war, will a new policy obtain in regard to street lighting? Will our local authorities, through their experiences now, decide to put the brake on the progress in prodigality that some of them prior to the war were making in installing electric lighting for street illumination? We cannot say; but it would not be astonishing to find it so. Far from the scenes of raids by enemy aircraft, the wrecking of the homes of civilians, and the blowing from life into eternity of men, women, and children, local authorities have lessened street illumination, for the sole purpose of economizing. It is, of course, a right thing for them to do to reduce as much as possible the claims of local government on the pockets of the ratepayers, when these pockets are acutely feeling the strain of providing money for the war, and meeting the increased cost of necessaries. Example by our rulers—even though the rulers be only local ones—is proper. In other cases in the danger zone, the reduction of lighting that was at first thought sufficient to hide the identity of towns, streets, and property, has either been deemed insufficient, or the local authorities have found that public lighting is a convenient means for producing much-needed current economy. The lessons of the present will not be lost upon them, though we are among those who would be sorry to see a continuation of the depressing after-dusk conditions of our streets any longer than Germany thinks that by raids, murder, and destruction of private property, military ends are served, honour is gained, and their attempts at justification will find acceptance at the Judgment Seat. The further lessening of public lighting decided on in many places is to a substantial extent, as measured by money. Example will suffice. Brighton has resolved to lower the expenditure for street lighting by a further £5000 a year. This, added to the former reduction, represents a loss to the Electricity Department of £9000 per annum. Last half year the Gas Company sold to the Corporation 14 million cubic feet of gas less for public lighting. Running over to the west, the Cardiff Corporation have determined to bring down the estimate of £9850 for the street electric lighting to £7586—a reduction of £2264. Lamps that have hitherto been extinguished at midnight are now to be extinguished altogether. The Gas Company have had notice from the Corporation to "close down" about half the lamps supplied by them. This will result in an estimated saving in cost of £3826. In Aberdeen, reduced street lighting has resulted in a saving of £5352. These are only instances of what is going on all over the country.

When Peace is Declared.

Months ago "Installation Topics" in "Electrical Times" was urging manufacturers to begin to make preparations for illumination work on the Declaration of Peace. "D" and "P" capitals please, as the words want a lot of enforcing to enable one, while things are as they are, to fully appreciate their meaning. Declaration of Peace seems to be something that is so far ahead that we hardly dare to think much about it, though confident that, when it comes, it will be so completely in favour of the Allies that we shall not think it very much amiss if a bit of extravagance is indulged in in celebrating the event by great rejoicing. There will certainly not be in our times another occasion for a display in connection with the end of such a mighty and tragic war; and no one would desire it. However, though the end of the terrible conflict is hidden somewhere, as appearances are, in the distant future, the writer of "Installation Topics" is again urging preparation by manufacturers, and the placing of orders by electricity undertakings, so that there shall not be disappointment when the rush comes. We have not so far seen any sign of preparation for rejoicing; for the time being, money, energy, and machinery are needed for prosecuting, and must be concentrated upon, the work that is necessary for victory. What money, energy, and machinery there are to spare from munitions work are all required for greater necessaries than illumination strip, electric carbon lamps, and illumination devices. The preparations for rejoicing can well be put off until the end is a good bit nearer than it is to-day, when we can begin to breathe more freely again, and seek some rest from the present continuous strain. It is rather imagined, too, that electrical manufacturers cannot, any more than other people, afford to let dear money lie idle in stock, for perhaps many long and dreary months, in anticipation of an event which will come—but, when? This money may be badly wanted ere the days of rejoicing and of public illuminations arrive. In the lugubrious streets of London on these nights, our imagination will not run to picturing them yet awhile flooded with lights from myriads of electric lamps, scintillating gas jets, and monstrous flares.

Automatic Cooking.

The Westinghouse Company of America are attempting to dispense largely with the human factor in cooking (which factor is liable to err) by applying automatic control of time and temperatures to electric-ovens. But as different cooking operations—different meats, different foods, and different weights—require different times and temperatures, we are afraid that the human factor will be needed as much as ever for giving attention if there is not to be a good deal of failure, spoiling of food, and disappointment. Automatic control, too, has a nasty knack of breaking-down. However, a description of the American Westinghouse innovation will be of interest to readers of the "Memoranda;" and for these particulars we are indebted to the "Electrical Times." The ovens are arranged for automatic temperature and time control, thermometers in the oven doors being set for the desired temperature and a clock adjusted for the time at which it is desired cooking should commence. When the hour arrives, the circuit is closed automatically and the ovens begin to heat-up. As the ovens reach the desired temperature, they are switched off automatically by the thermostat, but cooking continues for some time with the residual heat stored-up in the ovens. The complete range comprises a couple of ovens, one above the other, and three boiling discs. The larger oven is rated at 1·5 KW. and the smaller at 850 watts, one 10-inch boiling disc taking 1·5 KW. at full heat and two 8-inch discs 1000 watts each. Three-heat control for the discs, which have readily replaceable elements of the radiant type, is arranged for by rotary switches mounted on the front. A smaller range is supplied, this having only one oven. The elements employed in the cooker are spiral wires laid in deep grooves in a moulded porcelain compound that does not chip or crack under extreme heat, and is impervious to water, acids, and alkalies. "With a range of this kind," it is said, "it is a simple matter to prepare meals, for the food is placed in the ovens and the thermostat and clock set to suit the class of cooking being done and the time when the meal is required. No attention, meanwhile, is required; the housewife may go out or attend to other duties in the certainty that, when meal time arrives, the food will be ready cooked, with a minimum power consumption." We are not sure about the "certainty."

Belated.

Our friends of the "Electrician" have been dozing. It has just come to their knowledge that, some time or other, an appeal was heard at the Limerick Quarter Sessions against the rates being utilized for the purpose of meeting the deficit on the working of the electric lighting concern. The grounds of the appeal were that, under their Provisional Order, the Corporation had power to charge up to 8d. per unit for current, and, until this figure was reached, the Order did not contemplate that any charge should be made on the rates. Mr. O'Brien, the appellant, won the action. There is a little resentment in the country that certain important items of news regarding the war are kept too long from the nation by the controlling forces at Westminster; but the offence on their part so far as delay is concerned is of an infinitesimal order compared with that of the "Electrician" on this occasion. The case at the Limerick Quarter Sessions was reported in the "JOURNAL" for June 10, 1913 (p. 753); the "Electrician" reports it on Sept. 17, 1915—only two years and three months after the case was argued, and the Court held that the Corporation had overstepped the limits of the statute when, with something in hand in regard to price authorization, they placed an extra rate of 5d. on the ratepayers to make good the deficit on the working of the electric-light department!

"Half Watts" in Street Lighting.

The "Electrician" recently gave data as to the electric street lighting in Chicago, together with the subjoined comparative figures of costs. The Chicago system of electric street lighting is stated to be the largest in the world. At the present time, there are in use 7200 100-candle power series tungsten lamps, 10,000 series flame arcs of the latest type, 8000 600-candle power type "C" tungsten lamps, and 3000 7-ampere enclosed arcs. The latter lamps are being rapidly displaced by the 600-candle power type "C" units; and it is estimated that, by the end of 1915, a total of 15,000 of these units will be installed. The comparison of operating costs was given recently by Mr. R. Palmer, of the Chicago Municipal Department of Gas and Electricity.

Comparative Operating Costs under Chicago Conditions.

Items of Cost.	465 Watt Flame Arc.		325 Watt Nitrogen Tungsten.
Power (at $15 per H.P. per year)	$10·25	..	$7·16
Sub-station operation	1·00	..	0·70
Carbons or renewals	4·90	..	8·00
Repairs to lamps and fixtures	1·75	..	0 50
Globes	0·70	..	0·40
Trimming	3·89	..	—
Patrolling	2·70	..	1·99
Cleaning globes	(inc. in trimming)	..	1·73
Repairs to circuits and posts	5·40	..	5·20
Miscellaneous expense	0·23	..	0·23
Office expense and superintendence	0·30	..	0·45
	$31·12	..	$26·36
Fixed charges on aerial construction	19 19	..	14·30
Total annual cost per lamp	$50·31 (£10·1)	..	$40·66 (£8·1)

It is mentioned that the fixed charges include interest at 4 per cent., taxes at 1·5 per cent., and depreciation at an average rate of 5·5 per cent. upon lamps, posts, line construction, sub-station buildings and equipment, transmission lines, &c.

WATER LEGISLATION FOR 1915.

[SECOND ARTICLE.]

IN the preceding issue of the "JOURNAL" [p. 634], the provisions of the Water Companies' Acts of the present session were noticed. We now indicate the powers in regard to the supply of water which have been granted to local authorities:

The Ammanford Urban District Council have, in a General Purposes Act, obtained authority to lay pipes in private streets, repair communication-pipes, maintain pipes used for the supply of water to several houses, or parts thereof, in the occupation of different persons, and fix and maintain appliances for the prevention and detection of waste. Where water is used in stables by means of a hose-pipe, the Council are authorized to charge not exceeding 20s. additional per annum for it. [*Parliamentary Agents: Messrs. Bircham and Co.*]

Additional powers in regard to their water undertaking have been obtained by the Ashington Urban District Council. They are authorized to construct a service reservoir in the parish of Cockle Park, four aqueducts in the parish of Newtown, and two others in the parish of Tosson, all in the county of Northumberland; and they are granted seven years within which to complete them. The Council may borrow £73,000 for the purchase of lands and easements for, and the construction of, the above-named works, and £8000 for new mains, service-pipes, &c.; the former amount to be repaid within sixty, and the latter within thirty, years from the date of borrowing. The Act contains a number of protective provisions, and confers on the Council power to supply water in bulk to the Morpeth Rural District Council. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Barnoldswick Urban District Council are authorized to construct new works, comprising an impounding reservoir in the parish of Elslack, a service reservoir, two aqueducts or pipe-lines, a catch-water conduit, and a road diversion, all in the West Riding of the county of York; and ten years are allowed for their completion. Until the impounding reservoir is finished, or the expiration of a period of ten years from the passing of the Act, whichever date is the earlier, the Council are to take water from the Elslack Beck; but afterwards they may discharge during each working day of 24 hours not less than 172,000 gallons of water into the beck, and not less than 10,000 gallons into the Acre Gill Beck, in a continuous flow. Provision is made for treating the water for the prevention of plumbism, and for affording a supply in bulk to the Earby Urban District Council. Borrowing powers are conferred to the amount of £99,155 for the purchase of lands and the construction of works, and £3000 for new mains, service-pipes, &c.; the former sum to be repaid within sixty, and the latter within thirty, years from the date of borrowing. [*Parliamentary Agents: Messrs. Lees and Co.*]

A short Act has been obtained by the Bury and District Joint Water Board extending the time for the completion of works authorized by their Act of 1903. By section 19 of that Act a certain period was specified for carrying out the New Hall and the Scout Moor reservoirs. This, however, was extended by the Board's Act of 1908; and a further extension is now granted to ten years from Aug. 14, 1920. By section 3 of the Act of 1908 the time specified in section 22 of the earlier Act for the compulsory purchase of lands was extended; and by the Act now under notice the Board obtain a further extension to seven years from Aug. 14 last. [*Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.*]

The Doncaster Corporation have obtained a General Purposes Act which contains provisions in regard to their gas and water undertakings. Those relating to gas supply were noticed in the "JOURNAL" for the 7th inst. (p. 496); and we now indicate the nature of the others. The Corporation are authorized to construct a service reservoir in the parish of Warmsworth, in the rural district of Doncaster; and they are granted seven years for its completion. Miscellaneous provisions relate to the supply of water for motors and in bulk outside the limits, the detection of waste, &c. Authority is given to borrow £16,000 for the construction of the reservoir; and fifty years from the date of borrowing are allowed within which to repay it. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

Two sections of the Lincoln Corporation Act (the gas portion of which has already been noticed) relate to the supply of water. By one it is provided that, notwithstanding the provisions of section 30 of their Act of 1908, relating to the price of water sold by measure, the Corporation may require that the charge to be paid for water so supplied for domestic purposes to any building shall not be less than the sum which would be chargeable for a supply given to the occupier of such building otherwise than by meter. The other section enables the Branston and Welton Rural District Councils to afford a supply of water to certain places specified, and the obligation of the Corporation in this respect ceases. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Lurgan Urban District Council, as notified in the "JOURNAL" early in the year, promoted a Bill to obtain authority for the transfer to them of the undertaking of the Lurgan Gas Light and Chemical Company, Limited. They obtained the necessary Act, and the gas portion of it has been duly dealt with [*ante*, p. 496]. It also contains several provisions relating to the supply of water which call for brief notice here. If water for domestic purposes is used for stables, washing motors, &c., by means of a hose-pipe, an additional sum not exceeding 20s. per annum may be charged; and authority is given to the Council to make bye-laws for the prevention and detection of waste, to supply meters and fittings, repair communication pipes, &c. [*Parliamentary Agents: Messrs. Lees and Co.*]

Important extensions of works are authorized by the Act obtained by the Metropolitan Water Board. A reservoir is to be constructed at Southgate, another at Eltham, two at Bromley, and two others at Farnborough and Shoreham respectively. In connection with these works eight aqueducts or pipe-lines are to be made; and there will be a well and pumping-station at Eynsford and a subway or tunnel in Camberwell. If the last-named work is not completed within five years from the passing of the Act, the power to make it is to cease, except as to the portion that may be finished. Fifteen years are granted for the carrying-out of the other works. Full provision is made for the protection of gas, water, and electricity mains and sewers. In the portion of the Act dealing with finance, it is provided that, as from the date of the Act, subsection 12 of section 22 of the Metropolitan Water Board Act, 1906, is to be read and have effect as if the sum of £2,000,000 had been referred to instead of £1,000,000; and the other provisions of the section are to be read and have effect accordingly. The Board have obtained power to borrow the following amounts: For the purchase of lands and the construction of reservoirs, &c., £285,150; for the aqueducts or pipe-lines, &c., £365,350; for the provision of machinery in connection with the authorized works, £32,000; and, with the sanction of the Local Government Board, such further amount as may be required for the purposes of the Act. For the repayment of the first-named amount the Board are granted sixty years; for the second, fifty years; for the third, twenty years. For the moneys borrowed with the sanction of the Local Government Board, the period for repayment will be such as they may prescribe. Provision was made in the Bill for the purchase by the Board, by agreement with the Corporation of Hertford, of the rights and interests (if any) in the Manifold Ditch, the Black Ditch, and several other ditches or watercourses specified; but this does not appear in the Act. When the Bill was in Committee a clause was inserted giving all the local authorities concerned the right to reinstate the surface of roads after the filling-in had been done by the Board. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Plymouth Corporation have obtained power to consolidate, with amendments, certain of the Local Acts in force in the borough, and make further provision in regard to its health, local government, and improvement. The Act is one of the bulkiest of the session, containing 264 sections and eleven schedules, which occupy 250 foolscap pages. Part III., relating to the supply of gas, has already been noticed [*ante*, p. 496]. Part II. is devoted to water. It is provided that the water undertaking as it exists at the time of the passing of the Act is to continue vested in the Corporation and held, used, and enjoyed by them. Power is given to provide and maintain water-works, lay down mains, hold lands and exercise powers for the protection of waters, and make bye-laws for the prevention of waste. The limits of supply are the borough and neighbouring parishes; and the charges for water for domestic purposes vary with the annual value of the premises supplied—ranging from 4s. where this does not exceed £5, up to 2 per cent. when it is above £100, and £6 where it exceeds £300, together with a sum equal to £1 10s. per cent. of the amount of such yearly value in excess of £300. The Corporation may supply water by meter for domestic, shipping, or other purposes; but the ordinary supply for shipping is to be at the rate of 1s. 6d. per ton, and 1s. for any fractional part of a ton. The Act contains the usual clause as to water used for stables, motors, &c., by means of a hose. The Corporation are authorized to borrow £60,000 for the construction of a conduit and water-mains; sixty years being granted for its repayment. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

An Act obtained by the Rhondda Urban District Council confers upon them (*inter alia*) further powers with respect to their gas and water undertakings. The sections bearing upon the supply of water authorize the Council to repair and maintain communication pipes, and to charge an additional sum not exceeding 20s. per annum for water used for stables, washing motors, &c., by hose-pipe. [*Parliamentary Agents: Messrs. Torr, Durnford, and Co.*]

The Corporation of Sunderland have obtained an Act authorizing them to reconstruct Wearmouth Bridge, and in so doing to interfere with the gas and water mains and pipes. It contains ample provisions for the protection of the Sunderland Gas Company and the Sunderland and South Shields Water Company, as noticed in the "JOURNAL" for the 7th inst., p. 496. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Wolverhampton Corporation have secured power to construct additional water-works, extend their limits of supply, and make further provision in regard to their water undertaking. The new works comprise a pumping-station in the parish of Lapley and Wheaton Aston, in the rural district of Cannock, a service reservoir in the parish of Brewood, and two aqueducts or pipe-lines. Seven years are granted within which to complete them. The wells are to be lined with steel or iron tubes for a depth of 300 feet below the surface of the ground, or to the bottom of the Keuper sandstone, whichever shall be the lower. No adit or other similar work is to be driven or constructed above the level of the bottom of the lining. If, after the pumping-station has been finished, a diminution or cesser is caused in the supply of water from any well or spring within a radius of two miles which is used as a source of water supply, the Corporation are to make good the diminution. The limits of supply are extended so as to include several parishes or parts thereof in the rural district of Cannock in the county of Stafford. Section 142 of the Corporation's Act of 1869 is amended in regard to the maximum water-rate, by the substitution of 8s. 8d. for 10s., and by the repeal of the portion limiting to £10 the amount received for a supply. This section will come into operation on Sept. 30, 1916. The Corporation are authorized to place meters in the streets for the purpose of detecting waste or measuring water, and to enter into contracts for the sale of water in bulk. Permission is given to borrow £80,000 for the purchase of lands and the construction of works, and £40,000 for the extension of mains, to be repaid in fifty and forty-five years respectively. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

Gas Production in Germany.—The statistics collected by the Central Gas Publicity Bureau of Berlin show that the production of gas by 862 German gas-works in the month of June last was 2·8 per cent. more than by the same works in June of last year. This is the first month since the war started in which the production of gas in Germany has been higher than in the corresponding month of the previous year. Statistics for the month of May were given in the "JOURNAL," Vol. CXXXI., p. 337, where reference will also be found to earlier reports.

Importation of Tar and Pitch into Russia.—The "Chemical Trades Journal" reports that No. 80 of the Russian Customs Tariff provides for the levy of Customs duty at the rate of 9·9 copecks per pound (gross) on "tar and pitch of all kinds, not specially mentioned" imported into Russia; and No. 83 provides for an import duty of 33 copecks per pound on "coal-tar pitch, bituminous mastic, and all kinds of fusible asphalts." H.M. Commercial Attaché at Petrograd reports that, according to an explanation which has been furnished by the Director of the Russian Customs Department, only the entire liquid product derived from the dry distillation of coal, not subjected to any further process whatsoever, and therefore containing in its composition ammoniacal liquor and benzol, is assessed for duty as coal pitch or coal tar under No. 80 of the tariff. The product differing from coal tar by the absence of this ammoniacal liquor and benzol is regarded for tariff purposes as coal-tar pitch, and is subject to the higher duty prescribed by Tariff No. 83, unless it is imported for the manufacture of briquettes, in which case it is admitted free of Customs duty, in virtue of a special law.

THE PRODUCTION AND RECOVERY OF TOLUENE FROM ILLUMINATING GAS.

In last week's "Journal," p. 635, an article on this matter—contributed by a well-known gas engineer—referred to a process patented by Mr. A. Rollason, of Long Eaton, which also formed the subject of an application for Letters Patent, the specification of which was abstracted on p. 652, of the same issue. The question is dealt with in two pamphlets issued by the Synthetic Gas Processes Company, Limited, of Nottingham. The first of these, issued last month, is entitled

NOTES ON THE CARBONIZATION OF COAL.

By A. Rollason.

The patentee has been specially engaged during the last five years in experimenting on the carbonization of coals, with the object of increasing the amount of gas and oils previously obtained.

Some hundreds of samples of coal from different seams in the British coal areas have been examined and tested in the laboratory and in full-sized retorts. As the result of this research work, patents Nos. 18,744 of 1911, 21,374 of 1911, 19,697 of 1913, and 18,490 of 1914 have been taken out and are in practical use.

It is well known that the ultimate toluol content in coal tar can be increased by washing the gases, after cooling, by the tar made during carbonization—as in the "C" process of the High-Explosives Committee.

The writer's experiments have proved that the results to be so obtained depend upon many considerations, viz.:—

1. The class of coal used, its age, percentage of oxygen, and possible yield of hydrocarbons.
2. The temperature at which the coal is carbonized.
3. The permissible practical margin above the calorific value of the gas necessary for the particular district.

As to 1.—With the high-class gas coals (such as Durham, Lancashire, or West Yorkshire), which are low in oxygen, the results may well be expected to be quite good, inasmuch as the quality of the coal lends itself to the production of large quantities of gas of high quality, and thus the toluol content should he high. It must be conceded, however, that, since the general reduction in the illuminating power standard, many gas undertakings have used a much cheaper coal.

The author's patent process should particularly appeal to the latter undertakings, as practical tests have proved that (without tar washing and the consequent loss in calorific value, *plus* the naphthalene trouble, a difficulty to be reasonably expected) a greatly increased toluol content can be obtained at trifling cost; and the Government may be sensibly helped in the present crisis of the country.

As to 2.—By the "Synthetic Process" the temperature of the retort may be considerably reduced, and an increased quantity of gas obtained, besides an increase in the quality of the gas.

As to 3.—It must be remembered that many gas-works, with modern high temperatures, and consequent high yields, strip their coals and partially decompose the hydrocarbons in the gas, and that therefore, unless the temperature is reduced, there is no margin of hydrocarbons in the gas for tar washing.

INCREASED YIELD OF HYDROCARBONS IN GAS AND TAR.

The later pamphlet, now ready to be put into circulation, gives further particulars of Rollason's "Synthetic Process for Increasing the Yield of Hydrocarbons in Gas and Tar."

It is pointed out that the reduction in the illuminating power standard has enabled gas engineers to utilize, for the production of gas, the second-grade coking and semi-coking coals, of which large supplies are available in most of the coal areas in this country. The principal drawback to their use is their high oxygen and sulphur content. When high temperatures are used for their carbonization, the coke and tar are of inferior quality.

Several proposals, based upon the addition of from 4 to 5 per cent. of lime to coking coals before carbonization, have been made to improve the quality of the coke and to reduce the sulphur in the gas. None of these have, however, had any general practical result.

During a series of experiments carried out by the Syndicate with a view to the use of second-grade coking and semi-coking coals for the production of gas, it has been found that many of these coals which contained a high percentage of hydrocarbons gave off their volatile contents so rapidly, at the commencement of carbonization, that when high temperatures were employed the hydrocarbons in the gas split-up into methane and hydrogen—leaving the carbon in the amorphous form, with the result that the coke was soft and friable and the tar poor in quality.

The numerous trials carried out showed that lime did not always improve the quality of the coke, but frequently had the opposite effect. Further experiments, however, finally showed us that we could attain our object—namely: To improve the quality and increase the quantity of the gas, increase the quantity of ammonia, reduce the sulphur content of the gas, and considerably improve the coke and tar, by adding lime in the form of limestone in certain proportions to these coals before carbonizing at a temperature above 850° C.

Our experiments showed that the most suitable proportion of lime to be added to the coal should be sufficient to transform the silicates contained in the ash of the particular coal used into a neutral silicate of approximately the type SiO_2CaO.

The only point of similarity between the former liming proposals and the present process consists in the broad fact that coal and lime are used to obtain the desired result. Beyond this, our proposals are quite distinctive in the principles which form the basis of our invention [see "Journal," April 16, 1912].

It is an easy matter by a simple calculation, based on the analysis of the coal and the composition of the ash contained therein, to arrive at the correct quantity of limestone required.

The action of limestone is entirely different from that of lime. Limestone, when intimately mixed with coal rich in hydrocarbons and with a high oxygen content, commences to decompose at a lower temperature than that of the resinous and other matters contained in the coal.

In order to determine the action of limestone, we have made numerous trials on second-grade coking and semi-coking coals, at high and low temperatures of carbonization, in charges varying from 2 cwt. to 9 tons, to which limestone in different percentages had been added. Under the conditions existing in retorts and coke-ovens, the limestone, when intimately mixed with these coals, commenced to decompose at approximately 130° C. Apparently the actions which take place during carbonization are: The calcium oxide when freed from its neutralizing agent, carbon dioxide, is in a nascent condition, possessing active chemical and catalytic properties, which assist in the decomposition of the volatile matters and organic bases contained in the coal, and facilitate the combination of oxygen and hydrogen so as to form water, and carbon and hydrogen to form hydrocarbons, thereby largely increasing the volume of hydrocarbons in the gas and tar.

The reduction of the excess of oxygen by the formation of water taking place at an early stage of carbonization and before the iron sulphide decomposed, limits the formation of oxygenated hydrocarbons and sulphur compounds.

The possibilities of considerably increasing the production of gas and ammonia from second-grade coking and semi-coking coal has encouraged us to continue our experiments during the last four years, in the face of numerous difficulties; and we have now achieved results which, at the present time, should be of great value to gas engineers.

The following comparative results were obtained at a modern carbonizing works, on coal an analysis of which showed that it contained in a dried sample (per cent.):

Ash 3·82, C. 76·78, H. 5·75, O. 10·62, S. 1·62, N. 1·41.
Coal broken to 2½ inches downwards.
Temperature of carbonization inside retorts: 1180° to 1210° C. (machine-stoked horizontals).

	Per Ton of Coal.		
	Coal.		Coal and Limestone.
Gas washed with anthracene oils, distillate 0° to 220° C. . . .	4·28 gallons	..	6·55 gallons
Toluene in distillate	2·96 lbs.	..	3·8 lbs.
Toluene recovered from tar . .	0 14 lbs.	..	0·41 lbs.
Gas washed by the "C" process:			
Calorific value of gas after washing, B.Th.U. per cubic foot shown on continuous recording calorimeter	537	..	555
Cubic feet of gas after washing, registered on station meter .	11,510	..	11,928
Toluene recovered from washing tar	0·27 lb.	..	1 01 lbs.

The coke was greatly improved, and a larger percentage of saleable coke was produced. The sulphur in the gas was sensibly decreased. The yield of ammonium sulphate was increased. The tar was of an improved quality. The results obtained at a lower temperature of carbonization were:

	Per Ton of Coal Carbonized.		
	Coal only 2 in. to 1 in.		Coal and Limestone. Coal below [illegible] in.
Temperature inside retort, 900° C.			
Cubic feet of gas per ton of coal carbonized	8560	..	9600
Gases washed with anthracene oils, toluene recovered from distillate	1·82 lbs.	..	4 87 lbs.
Toluene recovered from tar . .	0·147 ,,	..	1·91 ,,

It is therefore possible with this process, by crushing the coal sufficiently fine for the purpose of increasing the surface-contact of the limestone with the coal, to increase the normal yield of gas, which, upon washing by the "C" process, will give a large quantity of toluol in the tar and leave a gas containing sufficient light hydrocarbons to prevent the deposition of naphthalene.

According to the "Manchester Guardian," the Association of German Silk Dyers have issued a circular stating that dye prices are to be again advanced on Oct. 1—those for fancy shades being increased 20 per cent. and for blacks 30 per cent.—making the increases since the outbreak of the war 40 and 50 per cent. respectively. The explanation, no doubt, is that most of the coal-tar products in Germany are required in the manufacture of high explosives, and that in any case the demand for dyes would be very small in the present depressed conditions of the textile industries of the country.

CARDIFF MUNITIONS SCHOOL.

The premises which have, as already recorded in the "Journal," been specially erected by the Cardiff Gas Company on a portion of their land at Grangetown, for the purpose of holding classes for munition workers, under the Technical Schools Committee, were formally opened last Wednesday by the Lord Mayor (Alderman J. T. Richards). The building, in the provision of which acknowledgment is made of the kind offices of Mr. George Clarry (the Secretary and General Manager of the Company) is admirably suited to the work; and, as will be seen by the photographs, it contains an excellent assortment of lathes and other necessary tools—which have been furnished by the Gas Company and by other of the local employers. In this way, an excellent munitions school has been completed within six weeks; and at the time of opening some 270 persons had registered for entry to the classes, which will be worked on the shift system. No fees will be charged for tuition; but grants will be obtainable from the Board of Education.

The opening ceremony was presided over by Mr. J. Stanfield (the Chairman of the Technical Education Committee of the Corporation), who remarked that the action of the Gas Company showed great patriotism. In addition to the building and plant, they had provided cooking facilities. The Committee were very grateful to them, and to the other employers who had kindly lent lathes. The Lord Mayor, in declaring the building open, also voiced the gratitude of the city to the Company and to those firms who had done so much to start the classes.

In response to a vote of thanks, Mr. C. E. Dovey (the Chairman of the Company) said that when the proposal to provide premises was put before the Board, it was agreed to with alacrity. The knowledge that students could come there and learn to manufacture munitions was a sufficient reward at this time for what the Company had done. Mr. Clarry remarked that the scheme was launched with the idea of forming a link between the schools and the factories.

CARBONIZATION OF LIGNITE TAR.

Reference was made in descriptions of the plant at the new Obuda Gas-Works at Budapest [*ante*, p. 24] to the producer plant used for the consumption of brown coal or lignite. In a recent number of the "Journal für Gasbeleuchtung," Herr Viktor Schön the Deputy-Manager of the works, gave a description of the tar obtained from this producer plant and the method in which it is disposed of on the works.

He points out that where it is necessary to remove all the tar from lignite producer gas, the tar is an unwelcome bye-product. Generally, it contains a high proportion of water—up to 40 per cent.—which renders its working-up a difficult matter. By prolonged settling and heating, the water can be reduced to from 10 to 12 per cent.; but even so the lignite tar fetches only one-quarter to one-third the price obtainable for coal tar. In view of these facts, Herr Schön tried disposing of the lignite tar by introducing it into the large carbonizing ovens in use at the Budapest Gas-Works. The results showed that the whole of the lignite tar produced could thus be gasified without difficulty, and that the water in the tar was really a matter of no importance as it was only evaporated and again condensed with the liquor and coal tar. A portion of the vapours from the lignite tar remained as heavy hydrocarbons in the gas, and appreciably increased its calorific power; while another portion of the tar was converted to coke. The rest of the lignite tar mixed with the coal tar and had no injurious effect on the quality of the latter.

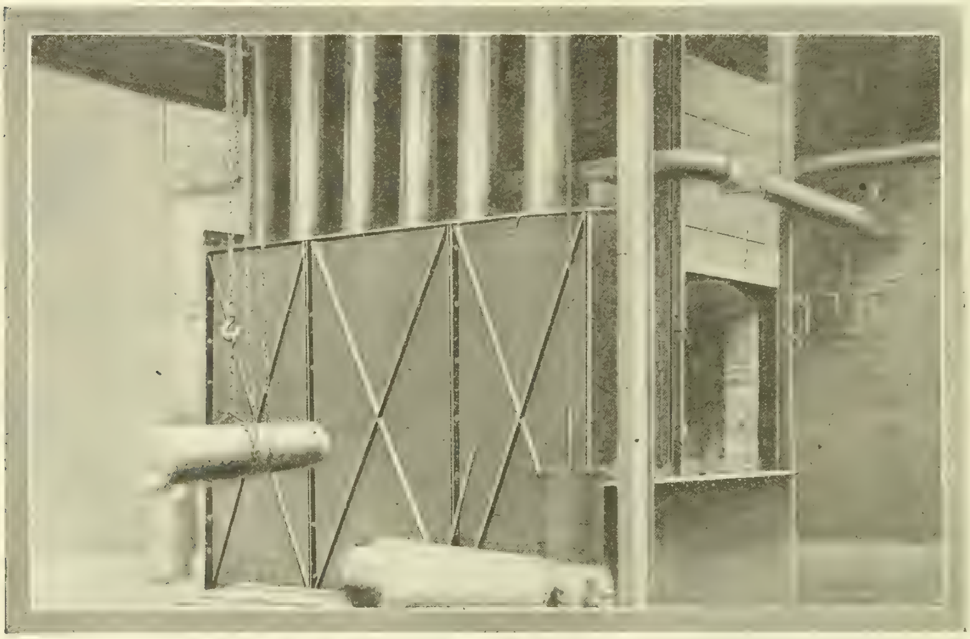
In a trial which was made of the method, the lignite tar was run into one of the carbonizing chambers from the twentieth to the twenty-third hour of the twenty-four hours' period allowed for working-off the charge. In the trial, the gas produced in this chamber was kept apart from the rest of the works' production; being led into the apparatus of the experimental plant of the works. The quantity of tar introduced into the chamber was $220\frac{1}{2}$ lbs., representing approximately the lignite tar obtained in the production of the quantity of producer gas required for heating one carbonizing chamber. The lignite tar flowed, at a temperature of about 95° Fahr., through a swan-neck pipe into the chamber. The tar, as used in this test, contained 8 per cent. of water, 4·6 per cent. of oils distilling below 200° C., 33·8 per cent. distilling between 200° and 300° C., 32·8 per cent. distilling between 300° and 360° C., and 20·3 per cent. of pitch. The average calorific value of the coal gas before the introduction of the tar was 375 B.Th.U. per cubic foot; during the addition of the tar, 414 B.Th.U.; and when the introduction of the tar was stopped; 358 B.Th.U. The difference in the quantity of gas produced during the three hours the lignite tar was being introduced is not so readily ascertained; but, assuming that the lignite tar would produce a gas of 838 B.Th.U. per cubic foot, Herr Schön calculates that, of the 11,089 cubic feet of gas produced in the three hours, 1014 cubic feet were obtained from the lignite tar. The aggregate calorific value of the gas produced from the tar would therefore be 850,000 B.Th.U., which is equivalent to about 1570 cubic feet of coal gas of 540 B.Th.U. Comparisons of carbonization with and without the addition of tar have shown, on the average, a difference in the make of gas per chamber of 1342 cubic feet. Analyses of the gas made at this stage of the carbonization showed that the proportion of heavy hydrocarbons was 1·1 per cent. when the lignite tar was being carbonized, as compared with 0·7 per cent. before the introduction of the tar. Trials have further shown that from 100 lbs. of the lignite tar, having a calorific value of 1,170,000 B.Th.U., 374,400 B.Th.U. go into the gas, 57,600 B.Th.U. remain in the coke, and 738,000 B.Th.U. are transferred to the coal tar. The effect on the character and composition of the coal tar is practically negligible. The products resulting from the lignite tar utilized in this way give it a value about 60 per cent. of that of coal tar.

GAS FOR WAR WORK.

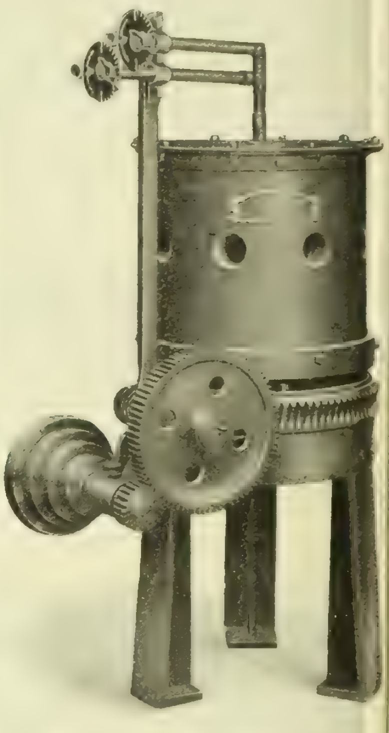
In a wrapper designed and executed by artists, the Richmond Gas Stove and Meter Company, Limited, have produced a booklet of considerable interest, illustrating and briefly describing, as it does, some of their furnaces engaged on war service. The advantages of gas for manifold operations carried on in connection with the preparation of material for both attack and defence has been recognized in all quarters; and the measure of the popularity enjoyed by Richmond gas-furnaces is indicated by the statement of the firm that they are in use in the Royal Arsenals, the large armanent works, in hundreds of motor and engineering shops, and many of the Munitions Committees' factories.

The photographs include furnaces for annealing brass cartridge and shell cases, buttons, steel ingots, carbon and high-speed steel in bar, and for forging, hardening, re-heating, and other processes. The larger of the two illustrations reproduced here shows a standard low-pressure gas and air annealing furnace for annealing steel ingots, which form the basis for all projectiles and component parts of ammunition. This particular furnace takes charges of 5 tons. The second illustration is of a rotary gas-furnace used in the process of "nosing" the shells for the famous 75 m/m guns, though it is not necessarily confined to this size of shell. It is fitted with worm-gear, ball-race [upon which the "turret" revolves], and four-speed cone pulley; the speed being under the complete control of the operator. The turret is heated by means of a vertical gas and air blast burner. There are also other patterns of furnace for similar work.

Working under existing strenuous conditions, many factories have found it advisable to provide means for employees to take their meals on the premises; and here, again, both for cooking and water heating, the service which gas can render, by means of suitable apparatus, is inestimable. As an example, there is shown in the booklet the Richmond "Duplus" boiler—an appliance that is economical in working and simple in construction—capable of providing boiling water for up to 450 tea-cups.



Richmond Five-Ton Charge Furnace for Annealing Steel Ingots.



Rotary Furnace for "Nosing" Shells.

NATURAL GAS ON THE CONTINENT.

The "Journal für Gasbeleuchtung" gave last month some particulars of the sources of natural gas which have recently been discovered and utilized on the Continent.

The article first referred to the extensive use of natural gas in the United States of America—especially in the Caddo Oil-Field to the north of Lake Charles. There are, however, prolific sources of natural gas in the oil districts of Caucasia, Galicia, and Roumania; and smaller supplies of natural gas occur in the vicinity of the Upper Bavarian Lakes, near Wels on the Danube, on the Island of Kokskär, on the coast of Esthonia, on the plains of Pisa, and at Lebrija, near Seville. The greatest source of natural gas in Europe, and perhaps in the whole world, was discovered in 1908 near the village of Kissármás, in Transylvania, which yields some 31,784,000 cubic feet of absolutely pure methane in twenty-four hours. The best-known source of natural gas in Germany is that of Neuengamme, near Bergedorf, which yields gas containing 91·6 per cent. of methane, 2·3 per cent. of hydrogen, and 0·8 per cent. of heavy hydrocarbons, with a residue consisting of carbon dioxide, oxygen, and nitrogen. This gas is piped to Hamburg, and mixed with the city gas supply. It is assumed that it is associated in its origin with the oil which is found on the Lüneburg Moor, though there is also a theory that the gas is due to blowers from a very deep-lying coal-seam. This natural gas has a calorific power of 900 B.Th.U. per cubic foot. It is also capable of being utilized as a source of valuable chemical products—such as formaldehyde, formic acid, and oxalic acid; though the utilization of natural gas in this way is only in its infancy.

Other sources of natural gas have been discovered accidentally in recent years in Germany. The Neuengamme natural gas was found in the course of boring for water for the supply of Hamburg. In the bogs of Oldenburg, natural gas has been used since the year 1906 for lighting and heating in a number of villages; the gas having been discovered accidentally through its escape, followed by ignition, from well water used for supply to boilers in a dairy. In some of the neighbouring districts of Holland similar village supplies of natural gas have been in use for several years; a gas dome being built over the water-tank, from which the gas is led to a gasholder. The gas in question contains about 74 per cent. of methane; and its calorific value is about 50 per cent. more than that of coal gas. The borings in Oldenburg are now nearly 100 feet in depth; while in Holland they are from 164 to 262 feet deep. The origin of the gas is not obvious, but it is found over a belt of country about fifteen miles in length and two miles in width, stretching from Oldebroek north-westwards to between Wilhelmshaven and Eckwarderhörn.

War Changes in the Price of Gas in Germany.

The results of replies to a circular-letter of inquiry issued to German gas-works by the Central Gas Publicity Organization of Berlin have been tabulated and published in the "Journal für Gasbeleuchtung" of the 4th inst. They show the changes in the price of gas which have been made as a consequence of war conditions in various German towns. In nine towns there has been some reduction in the price charged for gas. In thirty-four towns a change has been made from differential prices for gas, according to whether it was used for lighting or cooking and heating purposes, to a uniform or flat-rate of charge for both purposes. The result is that in these towns gas used for lighting purposes is obtained at a lower rate than formerly; but it is impossible to say from the figures published whether the new system of charging involves an increase or a decrease in the average price for all the gas sold. In seventy-two towns there has been an increase in the price of gas varying from 1 to 3 pf. per cubic metre [from 3·4d. to 10·2d. per 1000 cubic feet]. The figures refer to changes made prior to May last.

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A Help to Meter-Readers.—An idea which he has found to work well in his town [a purely residential one] has been adopted by Mr. Thomas Dann, the Manager of the Bedford Gas Company, as a result of seeing it mentioned in a description of American methods. It consists of a reply post-card which is addressed to consumers who may happen to be away from home when the inspector calls to read the meter; and it asks the consumer to kindly mark on the return half the position of the hands on the meter dials, and forward the card to the Company. This return half of the card has on it figured meter dials, with space beneath for the name and address of the consumer and the date; and the information when received, of course, saves the time which would be occupied by the inspector making a second visit to the premises.

INTERNATIONAL GAS CONGRESS.

Some of the Papers for this Week's Meeting.

The supplement to the "American Gas Institute News" received last week from New York contained as far as possible abstracts of the papers to be presented to the International Gas Congress, which is being held in San Francisco during this week, from Sept. 27 to Oct. 2.

First of all we may deal with the "Symposium" entitled "A Review of the Present Practices in the Manufacture and Distribution of Gas by British Undertakings"—that would have been introduced by the late Mr. Edward Allen, had his death not occurred to prevent. Four out of the five papers are summarized—that by Mr. John Bond, on "Carbonization," not being available at the time the supplement went to press. The remaining four papers are dealt with as follows.

BRITISH PRACTICE IN THE CONDENSATION, WASHING, AND SCRUBBING OF COAL GAS.

By Dr. W. B. Davidson, late Engineer of the Nechells Works of the Birmingham Gas Department.

It cannot be said that general British practice in the condensation of coal gas is based on accepted scientific principles. It must be remembered that most installations were put into use more than thirty years ago, have been found to answer their purpose, and are still in so good a condition that their renewal is hardly warranted.

Opinion is divided regarding the respective merits of slow and rapid cooling of the crude gas. Practically all the older designs actually in use are built for the purpose of slow condensation. Feld's remarkable process of fractional condensation has apparently met with small success. The Klönne cooling tower is said to have met with great success in Germany. This consists of a cylindrical vessel in which the travel of the gas is slowed-down and the condensate drips down against the stream.

It is questionable if any system of carbonizing is quite immune from "stopped pipes." Ascension or "take-off" pipes vary in diameter from 6 to 8 inches. There is an objection to increasing the size of the pipe in that greater labour is required in augering. Water-drips are sometimes fitted to the middle of the H pipe—preventing the baking of the pitch deposited on the sides. Relief has been afforded by a system of heavier charges, and the period of distillation increased from six hours to 8, 10, or 12 hour work. The take-off pipes of continuous verticals do not give much trouble. The same cannot be said for intermittent verticals.

It is the general custom to maintain a liquor seal in hydraulic mains by allowing a supply of weak liquor to run in and overflow by a weir-valve. In some works, tar seal and tar circulation are in use. In comparatively few places, it is customary to work without a seal. The advantage accruing from this arrangement is the maintenance of a more uniform pressure in the retort—there being thus less risk of loss of gas through back-pressure, or dilution of the gas with nitrogen and carbon dioxide. Where "over-pulling" is indulged in, the pipes and hydraulic main become overheated, and tar gets converted into pitch or coke.

With modern vertical retorts or coke-ovens, pitch formation has to be provided for by rapid tar circulation, or by raking and fishing-out the lumps of pitch. Ammonium chloride has been found rather troublesome. When the gas is hot, this salt is carried along as fine crystals until the temperature is lowered to about 220° Fahr. Spraying of the affected spot with weak ammoniacal liquor has proved an effective remedy.

Many gas-works are provided with air condensers only, and have no auxiliary water condenser. Formerly with lower temperatures, naphthalene blockages were practically unknown. It is now not uncommon to find back-pressure owing to naphthalene. The Carpenter reversible condenser was designed to meet this difficulty. Most modern coal-gas works include a water-cooled condenser, of which the forerunner was the Morris and Cutler design.

In the condensation of carburetted water gas, the condenser takes the form of a cylindrical steel shell; the gas entering at the top and water at the bottom. Mr. C. Carpenter, D.Sc., has inaugurated a rapid and drastic condensation, from 140° to 50° Fahr. in one apparatus. The loss in the quality of the gas is quite insignificant.

The general practice is to employ a washer (such as the Livesey or the Pelouze and Audouin tar-extractor) for the removal of the last traces of tar, and the concentration of the ammoniacal liquor. The hydrocyanic acid is extracted immediately after the tar-extractor has done its work. The processes employed are the prussiate and sulphocyanide. The apparatus for this purpose is the Holmes brush-washer; but the ordinary Kirkham washer is also used. A few gas-works concentrating their liquor, sell the crystallized product; others sell their filtered liquor on the basis of prussiate and ammonia content.

In the sulphocyanide process employed for washing, the sulphur was introduced over the bays of the washer. The wrought-iron portions of the washers corroded away, however, and the extraction of cyanogen was, therefore, discontinued. The Williams modification of the process is now in operation in a good many gas-works. Ordinary purifier boxes are used; the sulphur being supplied by the spent oxide—granular, and not in powder form. Ammoniacal liquor is sprayed on the material to keep it active. The efficiency is frequently 100 per cent. The product is sold as a solution; the ammonia being about 30 oz. strength.

It is usual to recover from 2 to 2½ lbs. of prussiate of soda per ton of coal carbonized, against about 3 lbs. in the case of sulphocyanide. Cyanogen has been a welcome profit to gas undertakings. Its elimination, moreover, facilitates the removal of sulphuretted hydrogen.

Following the cyanogen washing, come the final ammonia washers. Of the more important types, the tower scrubber is still on many old-established works, the coke-filling of which has given place to wooden grids. The absorption of pressure is sometimes a serious matter.

To supply to the sulphate plant liquor of suitable strength, it is necessary to cool the gas to at least 70° Fahr. Naphthalene often gives rise to blockages in tower-scrubbers. Steaming is usually resorted to as a temporary remedy. The most satisfactory system of washing consists in the use of three sets—the first set for concentrating the liquor, the second and third sets working in series to provide the most intimate contact between the gas and the washing medium.

We have besides tower-scrubbers various designs of rotary horizontal washer-scrubbers—such as the "Chandler," "Creeke," "Eclipse," "Holmes," "Kirkham," "Whessoe," &c. The effectiveness depends largely on the absence of short-circuiting. In the Holmes brush washer the apparatus is divided into at least eight bays; liquor strength increasing from the gas outlet where water is run in to the gas inlet where strong liquor overflows.

Walker's purifying machine is vertical. The Feld type does not meet with much success; but others, such as the Kirkham, have found favour.

In the selection of a washer, one should provide a good margin in capacity, on account of the installation of new plant. The Pelouze and Audouin tar-separators, cyanogen washers, and naphthalene washers, have sometimes been erected, increasing the load on the exhausters to a serious extent.

Direct recovery of ammonia by washing with sulphuric acid has not yet made much headway. Reduction of the naphthalene by washing with creosote or anthracene oil or with water-gas tar, is practised in many places. The more usual method is to add middle oils to the gas in sufficient quantity to accompany the naphthalene. The solid hydrocarbon is thereby kept in solution. The amount to be evaporated varies from 10 to 20 gallons per million cubic feet. The apparatus is usually a Livesey washer, or two or three bays of a rotary washer. Spraying of oils into the gas has been practised, and a simple form of steam-heated vaporizer of naphthalene solvent has been brought into use with successful results.

BRITISH PRACTICE IN THE PURIFICATION OF COAL GAS.

By J. Ferguson Bell, M.Inst.C.E., Engineer and Manager of the Derby Gas Company.

The purification of coal gas in closed vessels, by one of its so-called impurities (ammonia), is theoretically an ideal system, but so far has not fulfilled expectations.

The well-known F. C. Hills' process, which consists of heating crude ammoniacal liquor to within a few degrees of boiling point, was successfully used by the late Sir George Livesey, for several years, mainly for the removal of carbon dioxide. Hills' process was elaborated and modified by Claus, who ultimately succeeded in effecting the entire purification of coal gas in closed vessels, by combining the acid and alkaline impurities to form soluble salts. The Claus system of purification was tried at Birmingham by Mr. Charles Hunt, who erected an experimental plant in 1883. The results obtained were so promising, that the late Mr. James Stelfox, of Belfast, advised in 1886 the erection of a plant on the Claus system. After an extended trial, the process was discontinued. In consequence of uncertainty of action and loss of ammonia, the effective efficiency could not be relied upon to remove more than 60 per cent. of the total impurities.

Until recent years, lime was very generally used; but in consequence of the difficulty in disposal, and also the repeal by Parliament of sulphur restrictions (other than sulphuretted hydrogen), lime has been largely replaced by hydrated ferric oxide.

Lime Purification.

The lime at first absorbs both carbon dioxide and hydrogen sulphide. Later, hydroxy-hydro-sulphide is decomposed, forming calcium carbonate, liberating hydrogen sulphide thus: The sulphuretted hydrogen being driven forward into a clean lime vessel forms sulphide of lime, which will absorb carbon bisulphide.

In the larger works, where the purifying plant is laid out for reduction of sulphur compounds by the lime process, are either separate vessels to remove each impurity, or sets of six purifiers—the first four being lime vessels, and the last two oxide. In either case special care is required to keep the calcium sulphide active to remove the carbon bisulphide. Otherwise the result is disastrous—the sulphur impurities may be increased instead of reduced. Under the best conditions, it was found that to supply gas with a 20-grain sulphur penalty limit proved so irksome that the sulphur restriction clauses in various gas companies Acts of Parliament were gradually repealed.

For efficient purification by lime, purifiers of small unit capacity, suited to the quantity of gas made, give the best results.

With a set of four purifiers, 32 feet by 16 feet by 4 ft. 6 in. deep, the writer continues to purify 1,000,000 to 1,250,000 cubic feet of gas per diem—removing the CO_2 and SH_2, and reducing the CS_2 to an average of 18 grains per 100 cubic feet—the impurities in the crude gas entering the purifiers being:

Carbonic acid (CO_2) . . . = 2½ to 3½ per cent. by volume.
Sulphuretted hydrogen (SH_2) = 700 to 1200 grammes per 100 cubic feet.
Sulphur compounds (CS_2) . = 30 to 70 grammes per cubic foot.

This lime-purified gas is mixed with that treated with oxide only, and so reduces the percentage of carbon dioxide and residual sulphur in the mixed gases.

Oxide Purification.

The facility with which sulphuretted hydrogen (SH_2) can be removed from crude gas by the use of hydrated ferric oxide, and as residual sulphur in other forms is no longer compulsorily restricted, natural or artificially prepared hydrated oxide of iron is now very generally used in place of lime.

The purifying value of oxide depends not only upon the percentage of hydrated ferric oxide ($Fe_2O_3.H_2O$), but in addition on its physical and moisture contents. The author finds the addition of 1½ to 2 per cent. of air may be made to the second purifier of the series, without any noticeable reduction in candle power. This, with the daily reversal—the flow of the gas on the back-rotation system—lessens the number of changes by one-third. Revivification *in sitû* may be conveniently effected.

Oxide purifiers often require to be changed, simply in consequence of excessive back-pressure. With "Milbel" grids, the surface area of the oxide exposed is doubled, and the weight of oxide in the purifier may be increased by 50 per cent. with reduced back-pressure.

In the larger works a horse-drawn plough is sometimes used for turning and breaking-up the oxide; but a much better plan is to use a mechanical breaker, of which there are several efficient types.

Weldon mud—a bye-product obtained in the manufacture of bleaching powder—was used, but its avidity to absorb carbonic acid and become inert to H_2S, together with its high first cost, prevented its extended use.

Carbonic Acid (CO_2).

One per cent. by volume added, reduces the candle power by about 3½ per cent., the loss in candle feet being 2½ per cent. As the specific heat of carbon dioxide is high, its presence reduces the flame temperature by a greater degree than the percentage added, and the calorific value is reduced *pro ratâ*. It is, however, an economic question to be decided in each case, if the gain justifies the cost of its removal by lime.

Sulphur Compounds (CS_2).

The residual sulphur, chiefly in the form of carbon bisulphide (CS_2) is a noxious impurity, and should be reduced, as the effect of this impurity when burnt is similar to that of sulphuretted hydrogen (H_2S).

The most notable advance in purification during recent years has been made by Mr. Charles Carpenter, D.Sc., in conjunction with Mr. E. V. Evans, the Chemist of the South Metropolitan Gas Company. The gas is pre-heated to a temperature of about 400° C.; then passed through externally heated tubes containing fire-clay balls impregnated with nickel salt, which, heated to a suitable temperature promotes catalytic action in the presence of hydrogen at a temperature of 450° C., and produces decomposition of the CS_2. By this process, the sulphur contents are reduced by 80 per cent. at a cost just under ¼d. per 1000 cubic feet. The credit for successfully applying heat reaction to decompose CS_2 on a large working scale belongs to Hall and Papst, of the Portland Gas and Coke Company, Oregon, U.S.A.

Another promising process is that of M. Oscar Guillet, of Clermont Ferrand, France, in which the gas containing moisture is passed through oxide of iron heated to a temperature varying from 80° to about 200° C. The CS_2 is decomposed according to the well-known reaction: $CS_2 + 2H_2O = CO_2 + 2H_2S$.

Purifying Plant.

For many years purifiers were constructed of cast iron, 4 to 6 feet in depth—with a water-lute cast on the side plate. The movable cover is constructed of thin steel plates, riveted to a trussed top framing. This type of purifier has of late been almost entirely discarded for the more compact luteless purifier, for which we are indebted to the late Mr. Henry Green, of Preston, who was the first to make this departure. It consists of a vessel formed of cast-iron plates, with one or more division plates to form separate boxes, the top being constructed of cast-iron plates, with suitable openings, having light steel movable covers, the gas-tight joint being made by an india-rubber pad.

If there is plenty of room, purifiers erected on the ground with oxide revivifying and storage sheds on each side is an economical structural arrangement.

When oxide is used as the purifying agent, it is usual to provide only two tiers; with lime purification, four tiers. All purifiers should be prepared for not less than four tiers, though intended for oxide purification, as conditions may so necessitate the use of lime or other purifying agent at some future time.

When new purifiers are erected, the approximate size of the inlet and outlet connections may be determined by the formula:

d (diameter of connections in inches) = ⅓ (L + B).
L and B = length and breadth of purifier in feet.

For many years hydraulic centre-valves were employed to operate purifiers. Dry-faced centre-valves have largely superseded the old hydraulic form of valve.

We are indebted to Weck for an original and decided advance in the construction and working of purifier valves. This ingenious valve consists of a combination of valves fitted in one body, and so arranged that they control the flow of gas to and from the purifiers—working one or more boxes in series.

The Pickering valve designed for the overhead type of luteless purifiers, and Milbourne's purifier valves for bolting on the inside of the purifiers, are both skilful adaptations of the Weck principle. The latter render the whole of the interior of purifiers available for purifying material.

The advances made in recent years in the construction and working of purifier valves have simplified and added to the reliability of the valves.

PRESENT PRACTICE OF GAS DISTRIBUTION BY BRITISH UNDERTAKINGS.

By Walter Hole, Superintendent of the Leeds Gas-Mains and Distribution Department.

In considering the present practice of gas distribution by British gas undertakings it may be well, for the sake of clearness, to divide this paper into a low-pressure and high-pressure section.

Low Pressure.

There has been a very considerable change in the practice of distributing gas, for the reason that the fields of supply of most of the cities and towns have grown until they now cover an enormous area. As gasholders and all the etceteras of a storage station are expensive, it is a good thing that the introduction of high-pressure gas has made these unnecessary, except in the very largest areas.

Districting mainly takes two forms. Where the district lends itself readily to such a plan without too great duplication of mains and capital expenditure, the method of districting by altitudes is preferred. In cases where altitudes do not vary greatly, the plan of districting by separate geographical areas commends itself, as in this way districts which vary considerably in character may be governed separately. The industrial quarter, with its heavy day load, is thus treated according to its needs, without any necessary consideration of the other areas of a vastly different character whose requirements may vary widely.

A third plan (which may or may not be properly classed as districting), which is becoming increasingly adopted, is that of the belt-line main. As, however, such a main is generally used for the transmission of high-pressure gas, its purpose and usefulness may be more fittingly discussed in the high-pressure section of this paper.

The extent of the individual demand for gas, and the importance of carrying proper pressures so as to afford each consumer a fully adequate supply, is increasing. There appears to be no other plan of meeting all the complexities involved in maintaining a sufficiency of supply for all, with an over-plus for none, than that of maintaining a pressure in the mains sufficiently great to meet the highest demands, and to govern-down to others where necessary. The adoption of such a plan makes it imperative that the distribution system be so laid and improved as to resist successfully the increased tendency to leakage consequential on higher pressures.

The maintenance of considerably higher pressures on distribution mains will necessitate a considerable capital expenditure for service governors and for controlling the supply to consumers where pressures are much higher than necessary.

A considerable amount of pioneer work has been done in the line of automatic distance control of pressures; the points chosen for control being naturally those most disadvantageously situated from the point of view of supply. Three methods for effecting this purpose are in use—the simplest being the ringing of an electric bell in the governor-house when certain predetermined limits of pressure are exceeded at the point selected. A modification of this method allows a continuous indication of the distant pressures on a dial in the governor-house, combined with the ringing of a bell when certain points are reached. A third method attempts the completion of the whole process by not only signaling the pressures, but also automatically loading or unloading the station governors affected in accordance with the conditions obtaining from time to time.

The daytime consumption has now become such an important part of the output of most gas undertakings that much higher pressures are maintained throughout the hours of daylight than was formerly the case.

The main pipes in general use for ordinary purposes are of cast iron. The durability and adaptability of pipes of this material are beyond question; but the tremendous increase in roadway traffic places them at considerable disadvantage, due to their liability to fracture. A remedy for this trouble is being sought along three different lines: First, the laying of the smaller distributing mains under footpaths. Second, the provision of suitable subways in which the pipes may be berthed. Third, the use of steel mains, which by their own resilience will take-up and neutralize roadway vibrations.

With regard to the durability of steel mains, it is far too soon to speak with any degree of certainty, inasmuch as their introduction for general use is so recent that no one can have had a very extended experience. A steel main was recently uncovered, which was laid in 1899, and was found in excellent condition.

Informed opinion is steadily tending to the substitution of heavier grades of pipes for those used when steel pipes first came into general use.

Both with cast-iron and steel mains the open socketed lead joint is in common use. Experiments have convinced the writer that the lead wool joint is of much greater strength than one of run lead; but it is a mistake to suppose that the greater strength is due to the greater density of the lead wool packing.

Experiments made on the crystallization of lead ring tend to show that the shrinkage of the lead ring toward the centre is one of the reasons for the essential inferiority of the run-lead ring as a jointing material.

Pneumatic caulking has not yet been introduced.

The rigid or telescopic joint has superseded the ordinary type of open socket joint for steel mains, which in turn appears likely to be eclipsed by the growing popularity of the welded joint.

Welded joints require more room than for making ordinary lead joints. Where long lengths of trench may be kept open, practically the whole of the jointing may be done above ground. The welded joints bring the ideal of a single continuous pipe from works to consumer within the range of practical politics.

The welded joint may be made in either one of two forms—the butt-weld or the telescopic socket weld. While it is admitted that a little of the strength and elasticity of the metal are sacrificed in a welded joint, experiments have shown that these changes are much less than has frequently been alleged.

Services are generally of wrought iron; and the economy of using only the heavier tubes is being increasingly recognized. In all cases wrought-iron pipes for services are given a good protective coating before being used. Malleable fittings are fairly extensively used; but the writer's experience is that they are less satisfactory than ordinary wrought-iron fittings.

A very considerable rise has taken place in the standard of public lighting due to the introduction of large unit lamps of both high and low pressure types, with the natural result that many of the principal thoroughfares are now very brilliantly lighted.

The development of automatic control has taken two principal forms—namely, clockwork and pressure wave. The best known types of the clockwork device are the "Gunfire" and "Horstmann;" and of the pressure wave, the "A. & M." and "Broadberry" are the most conspicuous examples. The experience of a full year's working with 250 A. & M. controllers shows 0·023 per cent. of failures per actuation, which result is confirmed by the writer's own experience.

In adopting any pressure-wave system it is necessary in a large undertaking to provide against the possibility of stocks being low, and consequent inability to give the necessary pressure wave by means of the holder alone. This is done in the City of Leeds by means of a motor-driven fan.

High Pressure.

The question of high-pressure gas distribution has been before the British gas profession for a little more than ten years. For some time the early installations were small, tentative, and rather experimental. The demand for gas supply to sparsely peopled suburbs and out-districts has only been successfully and economically met by the provision of a high-pressure supply.

The term "high pressure" is construed as applicable to such pressures as are beyond the capacity of the gasholder to throw of itself, and which therefore requires the use of auxiliary apparatus. Accepting this definition, we may say that high-pressure gas is being used in this country to-day for four different purposes: 1. For the supply of storage holders at distributing stations. 2. For boosting the low-pressure system. 3. For direct supply to consumers. 4. For belt-line reinforcement of pressures.

The most common use to which high-pressure gas is put in this country is to boost-up or reinforce the supply at various suitable points in the ordinary low-pressure distributing system.

The flexibility of such a system is one of its most attractive features. Once suitably installed, it may be very largely extended, and the carrying capacity of the feeder mains may be greatly increased by working at high pressure. Another attractive feature is the economy possible by laying mains of smaller size.

Another form of boosting which is now coming into increasing favour is that in which a belt pipe-line girdles the whole area at some considerable distance from the centre, and is the means of introducing a reinforcement of supply into the mains on, or approaching, the outskirts of the area. By means of a continuous belt-line, pressures throughout the whole district may be maintained at any predetermined standard.

The various types of compressors used in this country may be classified under four heads. For the lower pressure of 15 to 20 inches head of water, fans of the Rateau or Sturtevant type, either motor or turbine driven. High-speed fans used when compressing gas to a pressure over 40 inches head of water. For moderate high-pressures, up to 5 lbs. per square inch, compressors of the rotary type are being generally used. For pressures over 5 lbs., reciprocating compressors of the Worthington or Ingersoll-Sargeant type give the most economical results.

The importance of the provision of efficient gas governors needs no emphasizing. Failure in this respect may lead to most deplorable results. Fortunately, there are governors on the market capable of doing most satisfactorily with exceedingly variable quantities of gas.

The difficulties of making the diaphragms and stuffing-boxes of dry meters strong enough to withstand heavy pressures have been successfully surmounted by the simple expedient of using geared inlet and outlet cocks.

The difficulty with regard to the porosity of the cast-iron cases of wet meters under high pressure has been overcome by the simple plan of filling up the pores with boiled linseed oil under pressure.

A number of meters of various types in which provision is made to give compensation for decreased volume due to compression, are in service, and have so far given satisfaction.

The application of high-pressure gas to customers direct is, of course, in its infancy at present in England. Some few undertakings in sparsely occupied districts are giving a high-pressure supply to consumers' premises, there to be governed down before passing through the meter. Great progress is being made in the provision of high-pressure gas-lighting for spacious interiors—such as covered-in markets. Another great field for the direct supply of high-pressure gas which is gradually becoming occupied is that of metallurgical operations of various kinds. High-pressure gas for public lighting is slowly, but none the less surely, impressing its merits upon our local authorities.

PRESENT PRACTICE IN THE SALE OF GAS IN THE UNITED KINGDOM.

By F. W. Goodenough, Controller of Gas Sales to the Gas Light and Coke Company.

Efficient salesmanship in the gas industry involves, I submit, the recognition of three facts:

(1) If you want every consumer to use as much gas as he can consume with profit or advantage to himself, you must make it easy for him to get an adequate and constant supply, and to get the most efficient appliances for its use. Then you must see that his appliances are kept constantly in efficient order.

(2) If you do not tell every consumer what you and your commodity are willing and able to do for him, he very likely will not know.

(3) If you want to consolidate your business on the surest foundation, you must get it fixed in the minds of every one of your employees that the consumers' interests and those of the business are parallel and not opposite; and your whole policy of dealing with the public—whether it be in giving advice, in rendering service, in receiving and dealing with complaints, or in settling disputes—must be based upon a conviction of this truth.

A policy founded upon these facts necessarily implies:

(*a*) The laying of adequate mains, the installation of capacious carcass pipes, and the maintenance of a good and steady pressure; the provision of slot meters for the poorer class of consumer; easy terms for the supply and fixing of apparatus; well-equipped show-rooms in suitable positions, staffed with trained salesmen and women; an efficient fittings staff; an equally efficient maintenance staff; reasonable maintenance terms.

(*b*) Effective publicity, including local, district, and national press advertising; expert canvassing; lectures, both domestic and scientific; good public and store front lighting.

(*c*) The provision and training of a good commercial and administrative staff imbued with the "spirit of the house" right down from the chairman of the board to the telephone operator, the office boy, and the doorkeeper.

The paper then treats under these headings: The laying of adequate mains; installation of capacious carcass pipes; maintenance of good and steady pressure; slot meters; supply of gas fittings and appliances; easy terms for the supply and fixing of fittings and apparatus; question of free loan and fixing; co-operation with the ironmonger; show-rooms; lady advisers; fittings and maintenance staff; maintenance of gas burners and apparatus; publicity; national publicity campaign; local publicity; personal publicity work; commercial and administrative staff.

In conclusion, the author said: If our review of what has been and what needs to be done leads us to a firmer conviction that, above all, our policy must be sound from top to bottom, broadly based upon the principle of efficient service, and to a clearer vision of how this policy may best be pursued, we shall have usefully spent our time, and will go forward to greater success than we have yet achieved.

Among additions to the list of prohibited exports contained in an Order in Council dated the 16th inst. is gas carbon, the exportation of which is prohibited to all foreign countries in Europe and on the Mediterranean and Black Seas, other than France, Russia [except through Baltic ports], Italy, Spain, and Portugal.

Next Monday evening a paper will be read by Mr. Sydney G. Turner, before the Society of Engineers, on the subject of "Law and Engineering." He will contend that while there are many subjects of common interest to the lawyer and the engineer, there is no common meeting ground. The subjects he will deal with are: Expert evidence; the engineer as arbitrator; the engineer and engineering contracts; certificates; municipal engineering and law; problems of modern highway construction and traffic conditions; sewerage and drainage; private street works apportionments; gas, water, and electrical engineering; and the legal aspects of all these branches of engineering work.

MODERN CARBONIZING SYSTEMS IN AMERICA.

Among the subjects down for consideration at Thursday's meeting of the International Gas Congress in San Francisco is a combined paper on the above subject contributed by the Society of Gas Engineering of New York City.

Introducing the paper, the authors said: Realizing the interest with which the members of the gas fraternity now regard the subject of carbonization, and appreciating the fact that such a paper would only be of value if the data were based upon actual working results, it was decided to corroborate and amplify such information as was already at hand by inviting the co operation of builders and operators of carbonizing systems of various types. In the preparation of the paper it was deemed advisable to make the comparisons upon a unit capacity of 2 million cubic feet of gas made per day.

With this in view, data sheets were sent to forty-four corporations representing builders and operators, with the request that the data be furnished, and where the plant from which the data were obtained had a capacity less or greater than 2 million cubic feet, allowances were to be made in order to place the data on a comparable basis. The object was to obtain reliable information from plants representative of systems now in operation, not estimates or probable improvements in results which might be made by building a new installation of a particular type.

Replies with complete data were obtained from nineteen sources, incomplete data from one, declinations from nineteen, and no reply from five. Plans and elevations of benches and retort-houses of practically all installations were furnished with the data. Among the nineteen complete reports, one includes the result of a thirty-day test of American coals in a foreign installation, and shows the effect of admitting a proportion of steam into the retort as compared with making straight coal gas. The data contained in the three reports were not obtained from operating plants, but were furnished by the manufacturers as characteristic of the results which could be obtained in the operation of their installations. The latter three reports, while of interest, have not been included in the final summary, and are not considered in the remarks upon the report as a whole.

For obvious reasons, it was necessary to regard all the information obtained as confidential, and each plant has, therefore, been designated in the report by a number and, for greater convenience in comparing the results from similar plants, the information has been grouped according to types, in the following order: Horizontals, Nos. 1 to 9; inclines, Nos. 10 to 13; intermittent and continuous verticals, Nos. 14 to 18; coke-ovens, No. 19. To facilitate the comparison of different systems, a table has been prepared, where the maximum and minimum figures of each of the different types of apparatus are given.

An analysis of the data contained in the tables affords the following information.

The area required for a horizontal retort-house of approximately 2 million cubic feet daily capacity varies from 9433 to 16,416 square feet. The area required is least where the charging machine operates from one side, and the greatest where the retorts are filled from both sides of the bench. The area required for an inclined retort-house of the same capacity is largely influenced by the length and cross-section of the retorts, and varies from 8848 to 10,871 square feet. The area required for a vertical retort-house depends also upon the dimensions of the retorts and the number of retorts per bench, and varies from 4800 to 6945 square feet.

The cubical contents of horizontal retort-houses varies from 392,490 to 872,000 cubic feet; of inclined retort-houses, from 491,164 to 578,212 cubic feet; and of vertical retort-houses, from 300,000 to 400,000 cubic feet.

The weight of refractory material required for horizontal settings varies from 3,396,000 to 6,119,000 lbs.; for inclined settings, from 5,356,400 to 6,690,400 lbs.; and for vertical settings, from 4,690,000 to 7,360,000 lbs.

The total weight of iron and steel in the horizontal settings varies from 372,000 to 737,938 lbs.; in the inclined settings, from 394,500 to 498,600 lbs.; and in the vertical settings, from 623,300 to 1,440,000 lbs.

The labour required to operate the retort-house for 24 hours varies from 125 to 266 hours for horizontals, from 147 to 200 hours for inclines, and from 57 to 106 hours for verticals.

In analyzing the charge per linear foot of retort, the type of machine and the cross-section of the retorts operated should be considered.

The candle-feet produced per pound of coal vary from 62 to 95 for horizontals; from 74 to 87 for inclines; and from 83 to 97 for verticals. Different types of burners were used for determining the candle power. For example, under Plant No. 2, it is recorded that a "Bray 'E. H.' 8-feet open flame tip" was used; for the Dessau plant, No. 14, a "Carpenter" burner; in other cases the Sugg "D" or Sugg "F" argand. As a result, the candle-feet depending upon these readings must be influenced by the method of testing, and are not comparable without an allowance for the type of burner used. Consideration should also be given to the probable effect of the grade of coal carbonized upon the candle power, the number of observations daily, and whether such observations were taken at regular intervals. Under Plant No. 12, candle-power observations were made only in the daytime and at 3½-hour intervals.

In comparing the B.Th.U. per cubic foot, there should be taken into consideration the yield per pound of coal and the quality of the coal from which the gas is produced, both of which will have an effect on the B.Th.U. per cubic foot and per pound of coal carbonized.

The tar recovered (in gallons) per net ton of coal varies for horizontals from 10·80 to 13·65; for inclines, from 11·06 to 13·29; and for verticals, from 14·40 to 15·15. The free carbon in the tar from horizontals and inclines averages over 24 per cent.; while that from verticals is less than 3 per cent.

The maximum ammonia recovered per net ton of coal for either horizontals or inclines is 5·80 lbs.; whereas for verticals the maximum ammonia recorded for a period of six months is 6·1 lbs. In a short duration test as high as 7·30 lbs. is claimed.

The furnace fuel used per 100 lbs. of coal carbonized averages 14·43 lbs. for horizontals; 12·32 lbs. for inclines; and 14 lbs. for verticals.

The low yield reported on one plant (No. 15) is said to be due to the fact that a certain proportion of the gas is used for heating the ovens.

Results based on periods extending over months or years should be considered as more reliable for comparison than those which are based merely on weekly or monthly periods.

CONCLUSIONS.

Reviewing the advantages claimed for each system:

Horizontals generally are low in first cost, easy to operate, simple in heat control, readily accessible, and may be designed so as to compensate for expansion or contraction of the refractory material.

Inclines require no intricate mechanical stoking machinery; permit the use of comparatively inexperienced labour; are more flexible in labour operation—the number of men employed being dependent upon the number of benches in operation, and may be designed without difficulty to take care of expansion or contraction of the refractory material.

It is claimed that verticals, as compared with horizontals and inclines, may be built so that a smaller ground area is required, can be operated with less labour, that a greater quantity of coke, ammonia, and tar is produced, and that more uniform results, higher candle power, and heating values are obtained. In the case of continuous verticals there is an additional advantage in the abatement of the smoke nuisance. Some difficulty has been experienced in designing the settings so as to compensate for the expansion or contraction of the refractory material.

The summary concludes with these words: Owing to the reticence of operators of coke-oven plants, we have been unable to obtain sufficient information to warrant comparison of this type of apparatus with those included in this report.

[The tables of figures referred to in the above *précis* were not available, in their complete form, at the time of its issue. We shall, however, take an early opportunity of publishing them in the "JOURNAL."—ED. J.G.L.]

SUBSTITUTING HEATING VALUE FOR CANDLE POWER AS A STANDARD.

By R. S. M'BRIDE, Associate Chemist, Bureau of Standards, Washington.

One of the three papers that, according to the programme, were to-day to occupy the attention of members attending the International Congress at San Francisco, was that written by Mr. R. S. M'Bride, of Washington, bearing the title "The Substitution of Heating Value for Candle Power as a Standard of Gas Quality."

In the abstract of the paper issued in anticipation of the meeting, the author pointed out that his object was to summarize the more important principles which must be recognized in the choice of a standard of gas quality, to point out some of the errors which must be avoided in making this choice, and to outline the most desirable methods for choice of standards or for substitution of a new standard for one now in force.

SPECIFICATION OF QUALITY.

The principal specification of the quality of a gas supply should meet the following requirements:

1. It must be a real measure of the usefulness of the gas for the principal uses to which gas is put.
2. It must permit economical operation—including (*a*) use of the most economical fuels; (*b*) adoption of the most efficient processes for generation and distribution; and (*c*) operation with the minimum of financial risk.
3. It should be clear in all details, and should require only simple tests for its enforcement—*i.e.*, it should introduce no ambiguity in meaning and no uncertainty, difficulty, or undue expense for tests.

The community of interest underlying the proper relation of a gas company and its customers is of first importance, although there is no doubt that far too many of the regulations now in force have been adopted without proper regard for this fact.

That requirement or standard of operation which permits the delivery of the largest amount of service for each unit of cost to the user, is obviously the best for the user and also the most desirable from the standpoint of the company, since it permits the company to secure its proper return and to maintain its property with the minimum of expense to the user of the gas.

As general principles, it must be borne in mind that the inducement to capital must be sufficient to bring it into the industry, and that progressive and efficient management must find greater reward than indifferent managements are allowed. But it must also be admitted that the advantages of improvements in the industry, of efficient management, and especially of growth of the industry through general and natural channels, must be shared with the public which offers to the companies the protection, the opportunities, and the facilities for operation as public service corporations. There is, or should be, a very real partnership, in which the public and the companies share in the rewards which follow from the growth of the business with generous patronage and good management.

In a majority of cases, only the results to be accomplished by the companies are prescribed; and the companies are permitted to bring about these results by any means which they may choose to employ. The operating engineer is generally in a much better position to determine the most economical methods of procedure in manufacture and distribution than is the technical staff of the regulation body. There are exceptional cases in which the authorities find it necessary to overrule the choice of the company, and prescribe methods as well as results, in order to protect the interests of the public from the prejudiced or incompetent decisions of company engineers. But fortunately these cases are rare.

In the ultimate analysis, it is desirable that there should be afforded:

1. Safety for the users of gas and the general public.
2. An adequate and continuous supply of gas at all times and for all parts of the territory which is, or should be, served by the company.
3. Proper maintenance of the producing plant and distributing system.
4. Fair return to the operating company.
5. Maximum service for each unit of cost to the user.
6. Intelligent conservation of the national or public wealth in the coal, oil, gas, and other natural resources of the country.

It is not proper to ignore any one of these six fundamentals; nor can any one of them, except the first (safety), be properly regarded as more important than the others. Indeed, each one is dependent for its accomplishments over any long period upon the successful accomplishment of all of the others; and it will be seen in the course of the following discussion, wherein each of these principles has an important bearing upon the choice of the standard for gas quality.

Estimates as to the percentage of gas which is used for various purposes can be made with some degree of certainty; but conditions of utilization are changing so rapidly that one should not place much dependence upon these figures. In any case, they are only of secondary interest, except for estimating the loss to the many users of open-flame gas-burners which may result from the diminution from the open-flame candle power of the gas; and for this purpose an approximate value suffices.

Heating Value and Candle Power.

Apart from the matter of freedom from chemical impurities, the quality of gas is judged by its heating value and its open-flame candle power. Certain other criteria are also valuable in a consideration of the quality or the usefulness of the gas for special purposes; but up to the present time none of these have been specified in rules or laws prescribing the quality of the gas.

In considering the value of these two standards, one must regard each in its relation to the five principal applications of gas: (1) Open-flame lighting; (2) mantle lighting; (3) domestic cooking, water heating, and room heating; (4) industrial heating; (5) power production.

Summarizing the matter, it appears that the heating value of a gas is a direct measure of the usefulness for industrial heating and for domestic water heating, room heating, and cooking; also that it is not an exact measure of the value for mantle lighting and for power production, but is more significant for these items than is the candle power; and that the open-flame candle power is a significant property for open-flame lighting only. However, the fact should not be overlooked that a gas of good open-flame candle power necessarily has a good heating value; and thus maintenance of a candle-power standard offers a large measure of protection as to the heating value of the gas. It is largely because of this fact that candle-power standards have so long remained in force.

The changes in requirements, as well as in methods of enforcement of regulations as to gas quality, have been very rapid in the past few years. For example, as short a time as five years ago, there was only one State in which there was a State Commission rule or State law in force prescribing a limit on the heating value of gas. At the present time there are thirteen regulations of this nature in force over whole States, and four other sets of rules are pending in which similar requirements are included. As the number of State Public Utility Commissions is increasing each year, it is not unlikely that within five years there will be some requirements as to heating value of gas for the majority of the States.

There is no special need for discussing further in this paper the principal reasons why it is now generally believed that a heating value standard is of greater value and significance than is a candle-power requirement. It is generally accepted without question that the heating value is a better measure of the general usefulness of the gas. It is important, also, to bear in mind the advantage to the gas maker of the heating standard, because of both the greater ease of regular operation to meet a heat-unit standard and the smaller percentage loss in heating value during pumping or distribution of the gas.

The tests of heating value, both for works control and for official inspection, can be made with greater accuracy than can tests of candle power. The uncertainties accompanying the enforcement of such rules are therefore a minimum. This is due not only to the accuracy of testing which is possible, but also to the exactness of the definition of the heating value. This property of the gas is a specific one, determined only by the character of the gas. It is not, as is the candle power, primarily dependent upon the character and condition of the burner used in the test, the atmospheric conditions, and other factors—many of which cannot be controlled or corrected for.

Selection of a Heating Value Standard.

The problem of selecting a proper standard for the heating value of gas is primarily an economic one. In its simplest form, the selection of a heating value standard would be one in which it is only necessary to determine for each of several qualities of gas the proper average price to the customer, and then to select that quality which permits delivery of the most heat for each dollar of cost to him. For example, we can assume a certain quality of gas and certain values for each of the principal items which go to make up the total charge to the customer, and from these compute the number of heat units which the customer would receive for a dollar. Then applying the same calculations to costs for other quality of gas, the relative value is made clear. An illustration of this method is given by the Bureau of Standards in its Circular No. 32.*

If full data were available for any given city and there were no complicating conditions to influence the decision in the case, it would be a fairly easy matter to adjust the standard for any special case to correspond with the local conditions. However, there are many factors which are of great importance in reaching such a decision; and it is the consideration of these special factors to which the greatest attention must be given.

Methods of Manufacture and Local Conditions.

The character of coals available in any locality is a very important factor in determining the quality of the gas which can properly be required. Indeed, the choice of methods of manufacture and of sources of coal are determined by the standard which is fixed for the quality of the gas in many cases. This is proper only if it is evident that this choice is the one which is likely to ensure to the user of the gas the most service for each dollar of cost.

In some cases where coal gas is to be made, cutting down the yield of gas per pound of coal would make it possible to comply with a standard which required production of a high heating value or high candle power. Some engineers urge that it is never justifiable to require so high a value as to make this necessary; but this is probably too sweeping a statement. Complete gasification of a coal is often desirable, in order to produce a coke very low in volatile matter. When considering such cases, however, the relative net gasholder cost per heat unit is not the only factor to be taken into account. [An example illustrating this point is given in the full paper.]

Summarizing the important points in reference to the coal supply, one finds that the standard should conform to the following conditions:

1. Not be so severe as to prevent a choice of the most economical processes of gas making.
2. Permit the use of the most economical coal available on the local market.
3. Be such as to allow operation to get reasonable yields of gas per pound of coal, and permit the manufacture of a quality of coke suited to the local market, if coal gas is made.

If a standard were to be fixed for a locality in which there was no gas plant, there would be no need to consider the advantages of one type of plant as compared with another, except from the standpoint of minimum total cost of production. However, in a majority of places standards which are adopted effect the operation of a plant already in use, and it is necessary to have the standard so adjusted that it will not necessitate the abandonment of a plant which is in a condition to operate efficiently.

The depreciated condition of a plant will in some cases also be a factor in influencing gas quality requirements. Lack of repairs and replacements will, however, seldom be an important factor except for short periods.

In any locality where especially favourable markets for coke, tar, benzol, or other bye-products are found, the advantages in low net gasholder cost with one style of plant and system of operation are often large enough to far overshadow any disadvantage in lower standard or large plant investment. In such cases the simplest form of cost comparison, like the illustrations given in the earlier sections of the paper, reveals the most economical conditions of operations.

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* See "Journal," Vol. CXVIII., pp. 501, 576, 634.

Gas when subjected to low temperature, to high pressure, or to "friction," loses certain constituents which are particularly valuable in contributing to the heating and lighting value of the gas. It is, of course, necessary to take account of these distribution losses in fixing standards which apply to gas reaching the customers' premises. But it has been found that the changes in heating value of the gas which occur are a much smaller percentage of the total than the losses in candle power that occur simultaneously. This is due to the fact that the hydrocarbons which condense from the gas contribute more to the lighting than to the heating value of the gas. The losses in heating value rarely exceed 5 to 8 per cent. of the total; and the candle-power losses are often several times these percentages.

The considerable value to the user of gas of uniformity in supply is sufficient in some cases to recommend one standard as preferable to another. However, the uniformity possible is rarely greater enough in one case than in another to be a deciding factor for any value up to 630 (even higher) B.Th.U. per cubic foot.

Testing for Quality as Delivered to the User.

The tests of gas quality should be made at points which will ensure results representative of the quality of gas actually delivered to the users. Tests made at the manufacturing works are of value; but they do not serve to detect deficiencies in quality which result from loss in heating value during supply, because of improper operation during the condensing of the gas. If tests at the works are to be used as the principal basis of control, it is desirable they should be supplemented from time to time by tests made at some distance from the works, so as to determine that the quality of the gas does not deteriorate unduly *en route* to the users.

In some State regulations, allowance is made for losses during compression and pumping of gas at high pressure. It is doubtful, however, whether there is any need for so large a tolerance in this particular as is sometimes made. It would rarely be necessary to allow more than a 25 B.Th.U. tolerance for compression and pumping of gas under ordinary conditions in the United States. To fix a requirement which would prevent such high pressure distributions is very undesirable. But the tolerance allowed in heating value per cubic foot should not be made so great as to permit gas of unnecessarily low quality being supplied at the distant points. If the gas before compression is well condensed, and then meets the general heating value standards, reasonable allowance to provide for necessary decreases during compression should be made.

Charging for Gas.

A very large part of the total cost of gas to the user is made up by charges which are more or less constant per year. In computing costs per 1000 cubic feet or costs per 1,000,000 B.Th.U., it is of great importance, therefore, to know what will be the total sales either in cubic feet or in B.Th.U., as the case may be. This subject has been discussed at great length on numerous occasions; but for the present it is sufficient to summarize the three principal conclusions which can be regarded as reasonably well established.

1. For most computations, it is safe to assume that the total heat required per year for present users of gas will be little changed by a change in price of gas.
2. Many users of small amounts of gas per month will tend to use gas to about a fixed cost per month regardless of the quality or price per 1000 cubic feet.
3. Although in the industrial use of gas there is a tendency toward a constant number of heat units employed each year regardless of quality, yet decreases in cost per heat unit make possible new applications for gas, and thus largely affect sales.

There are two special methods of charging for gas, other than the flat-rate per 1000 cubic feet, that are of interest in consideration of standards for quality. One system is that which has been proposed for adoption in a number of cities, whereby the charge for gas would be based solely upon the heat furnished—that is to say, the charge would be fixed per 1,000,000 B.Th.U., and not per 1000 cubic feet of gas. Obviously, there is no need to specify the quality of the gas which is supplied when this system of charging is adopted, except to ensure that the quality of gas supplied will be a reasonably useful and uniform one.

Another system of charging (of some interest in this connection) is that general group of rate schedules in which there is fixed for each customer a so-called consumer's charge and a demand charge, which are made to cover expense items that are dependent upon the number of customers or the customers' "demand," but independent of the quantity of gas used. In some rate schedules, these two charges are combined in a single charge per customer, which is graduated according to the customer's "demand." Of course, in any system of charging, there is a charge for the gas itself made according to the quantity of gas used. But this charge makes up only part of the bill, and for any small customer it is only a small part. In a number of cases engineers have argued from this fact that it is by no means as important to control accurately the quality of the gas as would otherwise be necessary. However, this conclusion is by no means justified. The average number of heat units which can be delivered to the customer for each dollar of total cost to the customer is the best measure of the efficiency of the system. It is therefore necessary to control the heat delivered to the customer under such a system of rates as accurately as under any other system. Otherwise, the rate to the small user and to the large user will not be properly distributed; and one class of customers or another will suffer unless the rate for the gas is fixed properly to correspond, for each class of customers, to the actual cost for the quality supplied.

Uniformity of Supply.

Obviously, it is very important that gas-using appliances give satisfactory operation at all times, with no great amount of attention on the part of the customer; since the majority of the customers of a company cannot be expected to adjust their appliances to meet any new condition of gas supply. To a greater or less extent the users of gas on an industrial scale can and will make such adjustments; but the domestic utilization of gas is ordinarily dependent upon such uniformity of supply as will permit satisfactory operation without adjustment of the appliances or fixtures.

There are four factors which very largely affect the safety, efficiency, cleanliness, and convenience of a gas-consuming appliance in the respects above referred to. They are: (1) The heating value per cubic foot; (2) the volume of air required for the combustion of a cubic foot of gas; (3) the pressure of the gas supply; (4) the density of the gas. The pressure can, of course, be regulated independently of the other three. But these other three are largely interdependent; and it is doubtful whether it is practicable to undertake to control all of the three properties at the same time.

It is only possible to control all of these factors to produce the ideal condition by very elaborate precautions. However, the general effect of each of the conditions is known; and changes which would otherwise be detrimental to the service could in some cases be cared for by changes in the other conditions of supply, thus tending to compensate for the influence of the first change.

It is, of course, necessary in making the change from one condition of supply to another, to bring about this change with such precautions that the customers will have reasonable opportunity for adjusting their conditions of use to the new conditions of supply. In a later part of the paper is discussed the importance of assistance to the customers at the time of change from one supply to another.

Adopting a Heating Value Standard.

In the adoption of a heating value standard, whether it supersedes a candle-power standard or whether it be adopted as an entirely new specification for gas quality, it is important to know what the quality of gas has been in the past. If it is found that the heating value of the gas which has been supplied in the past is not known, there is no material advantage in immediately proceeding to adopt a heating value standard. It would be better to proceed at once to determine what the quality of the gas then being supplied actually is, so that an intelligent comparison can be made. It is then possible to determine what is to be gained by a change in one direction or another, and to make at least an approximate estimate of relative costs for gas of the different qualities.

Although it is impossible to judge for every case what has been the relation of heating value standards recently adopted to the heating value of the gas previous to the enforcement of these requirements, it seems to have generally been the case that the new standard has permitted a decrease in the heating value furnished. For some small cities improvement in quality may have been made necessary. But usually there is very little evidence for such small cities; and the estimates which have been made to this effect are therefore of doubtful accuracy.

Requirements of State Commissions.

It is generally proper that, when a heating value standard is adopted, it should require gas of at least as good quality as was formerly furnished, unless there be some concession in price or evident need for increase in the return to the company. Two State Commissions have attempted to accomplish this by the adoption of a requirement that, in the case of any companies supplying a heating value above that which is required by the standard adopted, the quality must not be reduced below that formerly supplied without permission from the Commission, and without consideration of the reasonableness of changing the price of the gas to correspond to the new quality. In adopting the heating value standard of 565 B.Th.U. per cubic foot for Illinois, the Public Service Commission of that State made such requirement; and in connection with a standard of 575 B.Th.U. per cubic foot for Connecticut, the Public Service Commission of that State has fixed a similar regulation.

There is, however, one difficulty involved in the adoption of such a rule as that just referred to, since usually when the requirement is in this form, it fixes a standard much below the average formerly supplied, and thus unnecessarily encourages a general reduction of the heating value per cubic foot of gas. Unless it is established more clearly than it yet appears to have been, that a heating value materially below 600 B.Th.U. has an economic advantage, there is no need to change the present general practice. It would seem to be rational when fixing a standard for a whole State to establish a requirement at a figure which is approximately equal to the quality of gas supplied in a majority of the plants which are operating in a satisfactory manner and giving good service. Then, if it is found that some plants are unable to maintain this general average, it is quite proper to afford relief to such companies by special action—permitting them to supply a lower quality than that fixed by the general requirement, and to fix a special price for this quality. It is hardly proper to assume (as sometimes appears to have been done) that the standard must be fixed so that the poorest plant will, at the time of greatest difficulty, be able to meet the standard. To be really a standard for service in the proper sense, the requirements should be such as will ensure gas of good quality from all companies, with tolerances properly arranged to permit the necessary variations below the average required, either for single months, for single days, or for companies operating under peculiar conditions.

Although a candle-power requirement is no longer the best standard to be fixed for the quality of gas, it is nevertheless true that a good candle-power ensures to the user a gas of good quality, whether it be used for lighting, heating, or other purpose. When such candle-power requirement is superseded by a heating value standard, the problem is to find what heating value has been maintained in the past, and to make comparison between the heating value which has been supplied and that which it is proposed to supply. Whether the heating-value standard should then be supplemented by a secondary candle-power standard may also be a question of importance.

Readjustment of Gas Appliances.

If changes in the character of gas make necessary readjustments in the gas appliances, the company will, of course, stand ready to assist its customers in securing satisfactory arrangements for use of the new gas. And if a gas very low in open-flame candle power is to be substituted for one of high candle power, it is necessary also to consider means for the elimination of such open-flame lighting as cannot be satisfactorily continued under the new conditions. The object to be sought is the adjustment of conditions to a state where each customer will, with the new quality of the gas, be at least as well served as formerly; and if there is some advantage resulting to the companies from the change, the customers should share in the advantage by securing better service or cheaper rates.

In this connection, the very important influence of public opinion may be suggested. If changes apparently detrimental to the quality of service are made, the loss to the company because of unfavourable public opinion is often serious; since it may result both in decrease in sales and increase in expense for handling complaints. The public is often prejudiced because of its incomplete understanding of the facts. It is important, therefore, that a full statement of the facts be made to customers affected by a change, in order to make clear to them the mutual advantage which is expected from the readjustment of conditions.

Obviously, the proper standard for gas quality in any given case is closely related to the rates charged for the service. Indeed, more and more it is being recognized that, in the adoption of a particular heating value, it is necessary to consider the question of relative costs and relative rates to the public. It is, of course, unnecessary that the consideration of costs and rates be carried out in such minute detail in the course of adoption of standards for service as would be necessary in cases where the rate to be fixed was the primary object of the investigation. However, the relative costs should be known with reasonable accuracy, in order that the economic considerations may be properly taken into account.

WATER-GAS MANUFACTURE IN THE UNITED STATES.

This question formed the subject of two papers which (according to the programme) are being read to-day at the San Francisco Gas Congress. The first one was entitled:

HISTORY OF THE DEVELOPMENT OF WATER GAS.

By O. B. Evans.

A very brief sketch of the early history of water gas is first of all given; and the paper then describes and illustrates the retort form of apparatus. In this type, water gas is made by the passing of steam through coal contained in externally heated retorts. Naphtha is generally used for enriching and is sometimes admitted with the steam before it comes in contact with the coal, and sometimes mixed with the blue gas and thereafter fixed by passing through another retort. The heat requirements of such a process are discussed, and reasons are advanced indicating why it had to give way to the later forms.

In the generator-retort systems which followed, non-luminous water gas is made in one vessel from carbon heated by internal combustion, and later carburetted. Several types are described, and the fundamental objections to them are stated to be:

(1) They are not economical in fuel consumption.
(2) Their capacity is small.
(3) The fixing surface is small for a given volume of apparatus.
(4) They are generally designed for the use of naphtha, and are not well adapted to use the heavier oils of to-day.

The development of the Lowe system is traced from the original plant erected in 1874 to the modern type. The advantages and disadvantages of the various changes in design are pointed out, and reasons are given for the survival of those which have stood the test of time.

The desirability of being able to use soft coal is stated, and some general remarks are made upon the behaviour of bituminous coal when used in water-gas apparatus. Briefly, it melts and forms a blanket on the top of the fire, which prevents the uniform flow of air. Descriptions and illustrations are given of the Fahnehjelm, the Rose-Hastings, and the Rew appliances, and some of the reasons are pointed out for their failure to compete successfully with the present type of apparatus which uses a more expensive fuel.

Some of the principles of water-gas manufacture are next gone into rather fully, in the "hope that the recognition of such principles may assist in determining the possible chances of success of any proposed modification."

The subject of oil treatment is then discussed at some length, and reasons are advanced showing why the fractional treatment of oil which would seem to offer such a field for improvement in efficiency may really have but little to recommend it. The effect of "fixing" an oil in the presence of the hydrogen of blue gas is stated to be very desirable, and is given as one of the probable reasons for the abandonment of the oil-heater.

The effect of up-and-down runs and blows, and the rate of blasting, upon the efficiency and capacity of a set, is discussed; and it is stated that capacity is a function of the rate of blasting, and that this in turn is limited (among other things) by the ability to prevent dust from blowing over into the carburettor.

Some attempts to eliminate the hand-cleaning of generator fires by the return of combustion products beneath the grate and by melting the clinker and running it off as slag, are described; and the action of a generator fire in relation to the clinker problem is explained. A theory is advanced to account for the lack of success of many of the mechanical grates which have been tried. The automatic operation of water-gas sets, as developed by Mr. C. F. Zeek, at Pensacola, Fla., is briefly mentioned.

The difference in the view of the gas manager toward residuals between the early days of the industry and the present is fully brought out. Figures are quoted showing the increase in operating efficiency between one of the earliest generator-retort processes, in which the fuel consumption amounts to about 140 lbs. of coke per thousand, the Lowe process of about 1889, which consumed from 45 to 50 lbs., and the modern apparatus. The further possible theoretical saving is calculated, and a suggestion is made that by preheating the steam and air it might be practicable to reduce considerably the present consumption of raw materials employed.

BLUE WATER-GAS AND DEEP-FUEL COMBUSTION.

By A. G. Glasgow.

Economy in the manufacture of water-gas largely depends, the author points out, upon the efficient application of the principles of deep-fuel combustion to the operation of air-blasting. Oxygen and carbon, under different conditions, combine in different proportions to form two different gases. In the presence of sufficient oxygen, burning carbon saturates itself with two atomic portions of oxygen in order to form the product of complete combustion—carbon dioxide (CO_2). This may be called the "First Law of Combustion."

Where the supply of oxygen is insufficient to saturate the burning carbon, this "excess" carbon will partially satisfy its affinity for oxygen by combining with one atomic portion of oxygen to form the product of incomplete combustion—carbon monoxide (CO). This may be called the "Second Law of Combustion," and operates as follows: The affinity of highly heated carbon for this first atom of oxygen is such that, in the absence of free oxygen, it will rob saturated carbon (in the primary form of CO_2) of one of its atoms of oxygen—thus, $CO_2 + C = 2CO$.

This half-saturated carbon (in the form of carbon monoxide) is still combustible, and will combine with a further atom of oxygen to form the saturated product of complete combustion, carbon dioxide—thus, $CO + O = CO_2$. This may be called the "Third Law of Combustion."

Deep-Fuel Combustion in Gas Manufacture.

As commercially applied to gas manufacture, deep-fuel combustion may be generally classified under four heads:

First: The continuous manufacture of industrial, Siemens, or generator gas, where incomplete combustion products are used as a vehicle to convey the energy of the fuel to some point of useful application outside the generator. In the economical application of this process, the temperature of the fuel-bed is of no direct account. The sole requirement is that the blast gases (or more correctly speaking, the "draught gases") shall contain the maximum amount of available energy for the minimum consumption of fuel. Inasmuch as the sensible heat of these "draught gases" is largely lost or inapplicable, this means that they must contain the maximum of potential energy—*i.e.*, the maximum of combustible CO. To this end, in the manufacture of industrial Siemens or generator gas, the air supply must be carefully restricted, and the height and temperature of the fuel-bed are regulated, in order to produce partial or incomplete combustion (*i.e.*, combustion with the oxygen of the air to CO) as the ultimate result, and to minimize the unreduced CO_2 in the gas.

Second: With certain fuels, however—such as anthracite coal or coke—this incomplete combustion with the oxygen of the air to CO may be effected at such a rate as greatly to overheat the fuel-bed. This facility is utilized to make, instead of Siemens gas, a special and stronger mixture commonly distinguished as Dowson or producer gas. Producer gas is the result of admitting (often as an injector for the air) a quantity of steam, so proportioned to the volume of air that the desired temperature is maintained in the fuel-bed by a proper balance between the heat generated by the incomplete combustion with the oxygen of the air to CO, and the heat absorbed by the decomposition of the steam to H_2 and CO. The result is, therefore, a corresponding mixture of Siemens gas and water gas, made continuously.

Third: The intermittent manufacture of water gas, where the gas-making operation is frequently intermitted for a recuperating air-blast, designed to restore to the fuel-bed the heat which has been previously extracted in decomposing the steam into water gas ($H_2 + CO$). In this simple blue water gas manufacture, the character of the blast products is of no direct account, as they have no duty to perform. The sole requirement is that the air-blast shall restore to the fuel-bed the necessary quantity of properly distributed heat, with the minimum consumption of fuel and time. This means, of course, that these blast products should not carry away unconsumed fuel.

Fourth: A "combination" process, whereby any desired proportion of the heat energy developed during the air-blast period is conveyed by the blast products to an extraneous point of application, while the remainder of such heat energy is stored in the fuel-bed for the subsequent decomposition of steam into H_2 and CO. The two examples given of this combination process are: (*a*) The carburetted water-gas process; (*b*) the self-steaming blue water-gas process.

EXPLANATION OF TECHNICAL LIGHTING TERMS.

A very useful section of the report (recently issued) of the Departmental Committee on Lighting in Factories and Workshops is one in which the technical terms ordinarily used by illuminating engineers are fully explained. It will be well, therefore, if this particular portion of the report is reproduced (practically *in extenso*), although considerations of space forbid the like treatment of all the rest of the voluminous report.

The Committee say: A surface appears to the eye to be illuminated because of its capacity for reflecting and diffusing light which reaches it by variation from the various sources in its neighbourhood. Such sources may be artificial (*e.g.*, gas-lamps) or natural (*e.g.*, white clouds of the sun).

A clear distinction must be drawn between "illumination" and "surface brightness." Briefly expressed, illumination is measured by the amount of light received on the surface of an object from surrounding sources; while surface brightness is measured by the amount of light returned from the surface. In the case of non-luminous bodies, the surface brightness is always less than the illumination; for no surface returns again all the light which falls on it. If we have three different surfaces, each exposed to its own light source, we can adjust the sources to give equal illumination at each surface. The surfaces will not generally look equally bright; for the amount of light each returns to the eye of the observer will differ. In other words, each has a different surface brightness. On the other hand, we can adjust the sources so that all three surfaces look equally bright, and each will then have the same surface brightness. In this case, the illumination at each surface will be different. White cardboard returns nearly all the light falling on it, so that under a high illumination it will have a high surface brightness; a black floor or foundry sand returns only a small percentage of the incident light, and under similar conditions its surface brightness will be low.

ILLUMINATION.

The illumination at any surface is proportional to the amount of light incident on it; and when we speak of the "illumination" at a point of a surface, we mean the amount of light which falls on a unit of area of the surface adjacent to the point. This can readily be measured by means of illumination photometers, of which there are several portable types at the present time.[*]

The illumination at a surface depends not merely on the strength or candle power of the source of light to which the illumination is due, but also upon the distance of the source from the surface. Thus, apart from reflection from surrounding bodies, a light-source of one candle placed at a distance of 2 feet from a surface produces at that surface only one-fourth of the illumination it would give if the distance were reduced to 1 foot. Again, the amount of light from a given source which falls on any portion of a surface depends both on the distance of the surface from the source and on the angle at which the light rays strike the surface. If the part of the surface considered is placed at right angles to the direction of the light, a maximum number of rays will meet it; and its illumination, therefore, will be greater than if placed in any other position so that the light rays strike it obliquely. Hence in the consideration of the illumination in any room, it is not correct (as has sometimes been the practice) to take as a criterion the total candle power of the sources of light, or the candle power per square foot of floor area or per cubic foot of total volume, for all such methods leave out of account the effect of the distance of the light sources from the benches or floors which require to be illuminated. We consider, therefore, that the only rational criterion of the adequacy of the lighting is the actual illumination at the place, for instance, where work is being carried out, or in the case of gangways and passages, at the floors over which people are liable to pass.

The now-accepted unit of illumination in this country is the "foot-candle."[*] One foot-candle may be defined as the illumination produced by a light source of one standard candle at a point of a surface 1 foot from the source, and so placed that the light rays from the source strike the surface at right angles.

Thus if a source of one candle be placed at a height of 1 foot above a horizontal table, the illumination at the point of the table vertically below the source is one foot-candle. Similarly, with a source of 50 candles at a distance of 1 foot, the illumination is 50 foot-candles; while if the distance is increased to 10 feet (since the illumination is inversely proportional to the square of the distance from the source), the illumination at the point on the table vertically below the lamp will be 50/100, or 0·5 foot-candle. If the point on the table is not vertically below the source, the obliquity at which the light is incident must be taken into account, and the calculation is less simple, but the illumination can still be expressed in foot-candles. As already mentioned, however, illumination can always be measured directly by means of suitable instruments without recourse to calculation.

SURFACE BRIGHTNESS.

We see a body by means of the light which reaches the eye from its surface. If the surface is self-luminous, the light is due to the body itself; and the apparent brightness of the body depends on the intensity of the actions to which the luminosity is due. This is the case in a gas-flame or in the filament of an electric lamp. If the body is not self-luminous, its brightness depends on the nature and colour of its surface, and on the amount of light falling on it. The light by which an observer sees the body comes from the source which is illuminating the body and is reflected by the body to the observer. Some portion of the light is reflected regularly according to the laws of reflection, and its amount will depend on the angle at which the incident light falls on the body. But unless the surface of the body is polished, the larger portion of the light is diffused by the surface—being reflected in all directions. It is with this diffused light that we are mainly concerned in the case of vision. The amount of light reaching the eye from a given area of an illuminated surface depends upon the nature of the surface, the angle at which it is viewed, and the amount and direction of incidence of the light by which it is illuminated. We may imagine the luminosity of the surface to be due to a number of sources of light, each of definite candle power, so distributed over the surface as to secure that the proper amount of light travels in the direction in question from each unit of area. We may thus measure surface brightness in candles per unit area. Again, the apparent size of any portion of a surface depends on the angle at which it is viewed. In estimating the relative brightness of different parts of the surface, the eye does not compare the amounts of light coming from equal areas, but the amounts which come from areas which appear equal—from areas, that is to say, whose projections at right angles to the line of vision are equal. It is convenient, therefore, to define brightness with reference to these projected areas, and to say that the amount of light travelling in a given direction from an area of the surface whose projection at right angles to the line of vision is unity, measures the surface brightness estimated in that direction.

The quantity of light returned from any surface depends, as already stated, on various conditions. An ideally white surface is one that returns all the light falling on it. The brightness of such a surface would be numerically equal to its illumination, which is measured in foot-candles. Thus surface brightness, like illumination, may be expressed in foot-candles, and is then measured by the illumination at an ideally white surface just matching in brightness the surface under consideration. In the estimation of the illumination requisite for any given work, the nature of the surface on which the work is being done is, therefore, an important factor.

A surface appears coloured when it returns some rays of the spectrum more copiously than others. Thus a red surface is one which absorbs most of the rays except the red, and allows a preponderance of the latter to reach the eye. Such a surface behaves very differently to red and to blue light; but the distinction between illumination and surface brightness still remains.

GLARE.

The term "glare" is often used to indicate the serious effects on the eye of an intensely incandescent body, such as the sun or molten metal, but is now very generally applied to a class of phenomena in which light from bright sources or objects enters the eye in such a manner as to cause annoyance, headache, and other trouble, and often, eventually, diminished ability to see. The word "glare" is used to cover any of the following phenomena:

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[*] As shown in Appendix XVII., the accuracy with which illumination measurements can be made with properly constructed and calibrated portable photometers is of the order of *plus* or *minus* 5 per cent. An allowance of *plus* or *minus* 10 per cent. should afford sufficient margin to cover the instrumental errors of such apparatus.

[*] The "foot candle" is the unit generally employed in this country. On the Continent of Europe the "metre-candle," with a value roughly of one-tenth of a foot-candle, is used almost exclusively.

(1) The effect of looking directly at a bright source of light—such as an arc lamp—so that the observer is for the time being prevented from seeing other objects properly. He is temporarily dazzled, and his vision is impaired for a short period after the light ceases to enter his eyes.

(2) The effect which is produced by the presence of one or more bright sources of light towards the edge of the field of vision so that the rays enter the eye obliquely from them. An observer may never look directly at such sources of light, but he is nevertheless troubled by their presence near to the object at which he is looking. This is the commonest form of glare.

[Both these forms of glare (1) and (2) are directly attributable to the presence of unshaded sources of light.]

(3) The effect which is produced when the surface of cloth, metal, paper, or other material being worked upon is shiny or polished, and reflects light directly from some source into the eyes of the worker. Many satin cloths, for instance, have a "sheen" or a power of regular reflection of light which causes work with such materials to be very trying unless the worker is so placed with reference to the source of light that none of the rays can be directly reflected from the material into his eyes.

"FREQUENCY OF OCCURRENCE" CURVES.

It is convenient to employ a graphic method of setting forth the results of observations of illumination in factories to show what are the most general illuminations at present prevailing in any class of factories or processes. Curves may be drawn to represent the frequency of occurrence of different values of illumination. Such curves have the advantage of being in some degree an indication of the actual conditions which experience has shown to be necessary. In the case of foundries, for instance, there will be some rooms where the illumination attained is very high, and others where it is exceptionally low; but the question then arises, How do they tend to group themselves between the extremes?

To investigate this, we arrange the observations in groups—each group containing all those falling within certain selected limits. Then by taking a horizontal scale to represent illumination, and a vertical one to represent the number of observations in each group, we can plot on the diagram a number of points which in most cases lie on a fairly smooth curve. The area of a portion of this curve bounded by two vertical lines or ordinates drawn to correspond with any two illuminations, will represent the number of observations of illumination lying between these two limiting values; and the curve thus indicates the manner in which the illuminations observed are distributed among the places examined. One ordinate can be drawn to divide the curve into two equal areas, and the observation points into two corresponding groups. The number of observation points in each group is the same. In the one group of factories each observation point has an illumination less than that corresponding to this ordinate; in the other, greater. The point from which this ordinate is drawn is denoted the mid-point of the curve, and it is to this mid-point we wish to draw attention. The general shape of the curve should also be noticed. If a curve slopes gradually from its maximum ordinate towards the right, the number of factories having a higher illumination than that most commonly found is considerable; but if on the other hand it falls sharply away, the illumination found in the larger number of factories is seldom exceeded. [Further details are given in Appendix XV.]

DAYLIGHT FACTOR.

If it were possible to remove the walls and roof of a building, and so allow the full amount of light from an unobstructed sky to reach a given point, the illumination there would have a very much enhanced value. The ratio of the actual value of the illumination to this enhanced value, expressed as a percentage, is termed the "daylight factor," and is a measure of the lighting efficiency of the building at the point under consideration. Compared with the variations of the outside illumination, the daylight factor may be regarded as roughly constant for any point in a factory, and mainly depends on the window area which is effective in admitting light to the point in question. [The term is fully discussed in Appendix XV.]

Increase in Gas-Cookers in Germany.—A statement published under the authority of the Central Gas Publicity Bureau of Berlin, in the "Journal für Gasbeleuchtung" of the 11th inst., says that the war has afforded an opportunity of gaining information as to the increase in the use of gas for domestic cooking purposes. It was necessary for an estimate to be given to the authorities as to the metal requirements of the makers of gas-cookers for domestic use (apart from large gas-cookers for institutions, &c.), in order that the necessary supplies of metal might be allotted. An estimate was given of the number of burner-taps required, based on the number used in the manufacture of gas-cookers in the last year before the outbreak of war. It put the figure at 1½ millions. It has been further estimated that, on an average, 2·2 taps are used on each cooker. These figures show that there were produced in Germany in the last year of peace 680,000 gas cookers and ranges.

AMERICAN ILLUMINATING ENGINEERING SOCIETY.

Programme for the Washington Convention.

The Ninth Annual Convention of the American Illuminating Engineering Society was held from Monday to Thursday of last week at Washington. According to the current month's "Transactions" of the Society, the papers and reports to be presented were "replete with new and valuable information on practically every phase of lighting." Many of the papers covered, it was stated, extensive special investigations conducted by authorities of high standing; while for commercial men, or those interested chiefly in selling more and better lighting services, there were a number of especially interesting communications. A brief indication of the series—39 in all—is given; and pending an opportunity of reproducing some of the more important, the following abstracts may be of interest.

Report of the Committee on Nomenclature and Standards.—An annual report containing particulars of new terminology, definitions, symbols, &c.

Report of the Committee on Lighting Legislation.—A comprehensive statement of the status of lighting legislation. Includes a code on lighting which was drafted by the Committee.

Report of the Committee on Research.—Includes the results of an extended investigation of the various methods of heterochromatic photometry.

Report of the Committee on Progress.—This reviews the features of lighting progress during the past year. For the most part the report, which is rather a long one, is a summary of published matter; but it also contains much valuable information not heretofore on general record.

Lighting of Ships; by H. A. Hornor.—The requirements of ship and marine lighting are set forth, and methods of wiring and details of fixtures are discussed.

Lighting of a Passenger Steamer; by H. F. Spaulding.—Sketches past and present practise in marine lighting. The lighting requirements of a passenger boat are discussed, and compared with similar installations ashore. Describes the lighting system on the s.s. "Noronic"—a lake passenger boat. Includes illumination test data.

Life Testing of Incandescent Lamps at the Bureau of Standards; by G. W. Middlekauff, J. F. Skogland, and B. Mulligan.—Outlines the methods of tests and inspections followed by the United States Bureau of Standards. Includes a description of laboratory equipment.

Use of Portable Photometers; by W. F. Little.—Outlines the desirable procedure in the conduct of photometric tests with portable apparatus. Discusses the planning of a survey, and precautions which should be taken; a method of testing candlepower, illumination intensity, and brightness; maintenance of photometric apparatus; photometric errors, and means of avoiding them.

Compensating Illuminating Test Plates; by C. H. Sharp.—A discussion of the various errors inherent in illumination test-plates in use, and a description of a new form of construction which has been devised to eliminate these errors.

Illumination Efficiencies as Determined in an Experimental Room; by Ward Harrison and Earl A. Anderson.—A report on a series of illumination tests performed in a portable room designed for the purpose. The room dimensions and the arrangement of the outlets were varied to approximate the diverse conditions encountered in practice. Wall, ceiling, and floor combinations of white, black, and intermediate colours were tested with units of three general types of light distribution.

Semi-Direct Office Lighting of the Chicago Edison Building; by W. A. Durgin and J. B. Jackson.—Gives a description of a typical office and comparative tests of five lighting systems, showing the relative eye fatigue, glare, shadows, &c. Data are given on the illuminating effectiveness, appearance, dust factor, &c., for the complete installation.

Street Lighting with Gas-Lamps; by Geo. S. Barrows.—A discussion of modern street lighting with gas.

Arc Lamps for Street Illumination; by H. E. Clifford.—Outlines recent developments and characteristics of arc lamps designed for street illumination.

New Types of Incandescent Lamps and their Relation to Street Lighting Problems; by W. H. Rolinson.—A brief historical review and consideration of the fundamental requisites of street lighting. Various systems are classified according to unit and location. The choice of illuminants, means of regulation, and general equipment are also discussed. Special attention is given to recent developments in electric incandescent lamps for street lighting.

Application of Principles of Scientific Street Lighting; by F. A. Vaughan.—A comprehensive statement of the requirements of street lighting, based upon a special investigation conducted in Milwaukee, Wis.

How can a Combination Gas and Electric Company Render the Best Service to the Customer? by A. B. Spaulding and H. N. Potter.—Deals with the question of proper service to the customer; the education of salesmen and the customer; the relation between the salesman and the customer; and the question as to whether the sale of gas and electric illumination should be handled on a competitive basis or by combination men.

The Selection of a Standard Unit for Lighting; by W. H.

Moulton.—Discusses the problem of selecting a new style of standard fixture for commercial work. Features of various lighting units are outlined.

Small Incandescent Lamps and Special Illumination Problems; by R. P. Burrows.—Deals with improvements in the manufacture of small incandescent lamps for novelties and the industrial and medical fields. A number of present applications of these lamps are mentioned.

Illumination and One Year's Accidents; by R. E. Simpson.—Gives results of a study of one year's industrial accident records, the purpose of which was to determine the effect of the lighting conditions on the causation of accidents. Typical accidents are mentioned to show how lighting conditions have been responsible for injuries to workmen.

Application of Crova's Method of Coloured Light Photometry to Modern Incandescent Illuminants; by H. E. Ives and R. F. Kingsbury.—Discussion of the advantages and requirements of Crova's method for overcoming colour differences in heterochromatic photometry.

Relative Photographic and Visual Efficiencies of Light Sources; by L. A. Jones, M. B. Hodgsen and Kenneth Russ.—Sets forth the relation between the visual and photographic efficiencies of various lighting sources. Methods for the determination of these relations are outlined. A large amount of data is included, to show the relations between several sources and three types of photographic plates.

Method for Studying the Behaviour of the Eye under Different Conditions of Illumination; by F. K. Richtmyer and H. L. Howes.—Describes a method of studying visual efficiency which gives indications of being well-adapted to quantitative measurements of the manner in which different conditions of illumination affect the working eye. Several curves are included to show the resemblances and differences in the rates of reading various matter by several observers. Other curves exhibit the effects produced by placing frosted and unfrosted lamps in the field of vision.

Flame Pilot Ignition of Indandescent Gas-Lamps; by C. W. Jordan.—The features, advantages, and application of various methods and systems of pilot ignition are discussed.

Practical Illumination as Exemplified by Some Recent Installations of Incandescent Gas-Lamps; by R. F. Pierce.—A report on the various recent installations of gas-lamps.

Mercury-Vapour Lamps for Industrial Lighting; by W. A. D. Evans.—Outlines the lighting requirements of various industries; special reference being made to the application of the mercury-vapour lamp.

Retinal Sensibilities Related to Illuminating Engineering; by P. G. Nutting.—Points out the retinal sensibilities of importance in illuminating engineering, such as sensibility to brightness and brightness differences and to colour and colour differences. The interrelations of these sensibilities are duly outlined and methods given for their quantitative determination. The best data on each sensibility, including much that is new, are summarized in each case.

Vision and Brightness of Surroundings; by P. W. Cobb.—Outlines the results of an investigation of visual acuity and difference threshold. Describes new apparatus and methods used.

Flux Method of Obtaining Average Illumination.—Describes a method of obtaining the average illumination from a lighting installation on the basis of the total flux generated by the light sources. The lower hemisphere surrounding the lighting unit is divided in three 30° zones; and the lighting unit is classified according to the percentage of flux delivered in these zones. Having determined the proper classification for any lighting unit by means of one or more of the graphic charts shown, one is enabled to calculate the flux incident on the floor-area for each unit, and (by adding them all together) determine the flux over the entire floor-space.

Artificial Illumination of Architectural Interiors; by David Crownfield.—Deals with the lighting requirements of large interiors of different architectural styles and classes.

Artificial Lighting of Typical Offices in the State, War, and Navy Department Building; by W. E. Chapman.—Gives a brief description of the lighting conditions in a typical office of this building, which was erected in 1886. The present lighting requirements, and a description of the latest remodelled installation employing tungsten lamps are given.

Lighting in Downtown Office Buildings; by A. O. Dicker and J. J. Kirk.—Contains a description of typical downtown office buildings in the City of Chicago, representative of periods thirty, twenty, fourteen, and six years ago. The lighting in these buildings is contrasted with an installation in a recently completed building in the same district.

Present Practice in the Lighting of Armouries and Gymnasiums with Tungsten Filament Lamps; by A. L. Powell and A. B. Oday.—Gives descriptions and tabular data on the lighting requirements of numerous armouries and gymnasiums.

Ultra-Violet Light and the Eye; by W. R. Burge.—An investigation to determine which wave-lengths in the ultra-violet region of the spectrum are harmful to living tissue, and the mode of action of these wave-lengths in producing injury.

Production and Application of Ultra-Violet Rays; by M. von Recklinghausen.—A brief description of the different sources of ultra-violet rays. Includes a short description of the salient features of the system of sterilization of water by ultra-violet rays, and several pictures of recent plants.

The Parabolic Mirror; by F. A. Benford.—Directs attention to the increasing importance of parabolic reflectors for the projection of light for military and naval service, transportation, flood lighting, and spectacular illumination. For the most part a mathematical treatment of the reflector used with point, spherical, and disc sources. Probably the most complete treatment of the theory of the reflector that has thus far been presented.

Some Experiments on the Eye with Inverted Reflectors of Different Densities; by C. E. Ferree and G. Rand.—The fourth of a series of papers in which the effect of the various conditions of lighting on the eye is investigated. Gradation of surface brightness is made the chief variable. Semi-direct reflectors of six degrees of density are employed; and a correlation is made between the illuminating effects obtained and the tendency to cause loss of visual efficiency and produce ocular discomfort.

Effect of Variation of Atmospheric Pressure on the Candle-Power of Flames; by E. B. Rosa, E. C. Crittenden, and A. H. Taylor.—A summary of an investigation conducted at the United States Bureau of Standards.

Yellow Light; by M. Luckiesh.—Knowns and unknowns, and the various opinions regarding yellow light, are briefly discussed with respect to visual acuity, glare, fatigue, penetrating power, and æsthetic value. Outlines the procedure involved in altering the light from tungsten lamps to match a light from the kerosene flame or the old carbon incandescent lamp.

Artificial Illuminants for Use in Practical Photography; by C. E. K. Mees.—Illuminants differ in efficiency, quality, size of source, consistency, and flicker. Tables are given showing a classification of illuminants according to these characteristics when they are to be used with each of three classes of sensitive photographic materials—those sensitized to the whole spectrum, those with their sensitiveness in the blue-violet, and those sensitive only to the ultra-violet. Another table shows a classification of various available artificial light sources according to the photographic operations for which they are suitable.

EYE-EFFICIENCY UNDER DIFFERENT CONDITIONS OF LIGHTING.

Effect of Varying the Distribution Factors and Intensity.

Two lengthy papers on the above subject were presented at one of last year's meetings of the American Illuminating Engineering Society; and the full texts of them appear in the August part of the "Transactions"—extending to nearly a hundred closely printed pages. The authors of the communications were Mr. C. E. Ferree and Miss Gertrude Rand, of Bryn Mawr College, who had jointly prepared previous papers on the same subject.

The synopsis of the first of the present two papers points out that in their previous paper [read in 1913] a plan of work was outlined by one of the writers for the study of the effect of different kinds of lighting conditions on the eye. The problem was divided into three parts: (1) The determination of the conditions that give in general the highest level or scale of visual efficiency; (2) the conditions that give the least loss of efficiency for continued work; (3) the determination of the conditions that cause the least discomfort. Tests were described, especially designed to meet the requirements of each division of the work, and results were given to show generally the sensitiveness of the tests employed.

The work of the present paper is confined to the second division of the problem, and should be considered as an "explorative investigation for the determination of factors." Six aspects of lighting are considered provisionally, as sustaining an important relation to the eye—the evenness of the illumination, the diffuseness of the light, the angle at which the light falls on the object viewed, the evenness of surface brightness, intensity, and quality. Only the first five are dealt with in the paper. The first four are called, for convenience of reference, distribution factors.

In order to produce the variation in the distribution factors needed for the purposes of the test, three types of reflectors in common use were employed—a direct, a semi-indirect, and an indirect. The reflectors were selected with reference to the object of the investigation rather than as representative in every case of any particular principle of lighting. The illumination effects produced in each case were specified in the following ways: (1) A determination was made of the average illumination of the room under each of the three installations. (2) The brightness of prominent objects in the room—such as the test card, the reflectors for the semi-indirect installation, the reading page, specular reflection from surfaces, &c.—was given. (3) Photographs were made of the room from three positions under each kind of installation. These effects were then correlated with the results obtained with the eye-test.

In order to determine the effect of varying intensity with a certain grouping of distribution factors, lamps of different powers were used with each type of reflector employed in the distribution series. The illumination effects produced were specified by illumination and brightness measurements in the way described above, and the effects were again correlated with the results of the eye-tests conducted at each intensity of illumination.

The second of the 1914 papers was a continuation of the papers presented by the same authors to the Society in 1912 and 1913. It described the completion of the plan of work outlined in the preceding papers for one set of lighting conditions for three of the tests thus far devised by one of the writers [Ferree]—namely, a test of the ability of the eye to hold its efficiency for a period of work; a test for loss of efficiency of the fixation muscles; and a test for the comparative tendency of different conditions of lighting to produce discomfort. A report was also given of some miscellaneous experiments related to the hygienic employment of the eye, in which the following points are taken up: The effect of varying the area, and conversely the intrinsic brightness, of the ceiling spots above the reflectors of an indirect system of lighting; the effect of varying the angle at which the light falls on the work in a given lighting situation; the effect of using an opaque eye-shade with dark and light linings with each of the installations of artificial lighting employed in this and the previous work; the effect on the efficiency of the fixation muscles of three hours of work under these installations; the effect of motion pictures on the eye for different distances of the observer from the projection screen; a determination of the tendency of different conditions of lighting to produce discomfort; and a comparison of the tendency of these conditions to produce discomfort and to cause loss of efficiency.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Mr. Newbigging—Revolutionist.

Sir,—You have been very outspoken in your criticism of certain remarks I made in a paper read before the British Association, in Manchester, on the 9th inst.

I do not complain of this, but rather welcome it. My remarks were intended to rouse the gas industry from its lethargy. Instead of saying: "There is no reason why the Gas Department should not eventually become the gaseous fuel supplier," it would have been more correct to say "*will* become the gaseous fuel supplier." The gas industry in years to come must take this position, or practically no position at all. This is patent to anyone who does not shut his eyes to facts, and the trend of events.

It is obvious that the change will be gradual, and many years elapse before the position of the lighting load, and that of the cooking, heating, and industrial load, are reversed from what they are to-day. The best means to be adopted to meet the change will, as you say, have to be the subject of critical investigation.

In my opinion, one of these (to effect economies) must be a considerable reduction in the calorific value of the gas. This would not be so revolutionary as you foreshadow. Modern methods of carbonizing are teaching us that, from a ton of coal, very large yields of gas can be obtained of comparatively low calorific value, without unduly altering its specific gravity or excessive saturation with incombustibles.

You put a strong case as to the advantages of gas for lighting. But at the same time you cannot ignore those on the side of electricity; and, unfortunately, they are the ones that weigh with the public. There are many people using gas for domestic lighting who are not doing so because they prefer it, but because of the cost of fitting-up their houses for the change to electricity. The existence of a greater part of our lighting load depends on this adventitious circumstance, and is therefore a precarious one.

The sooner we take into consideration the position which is being created by the lighting consumption becoming a gradually diminishing proportion of the total consumption, the better. We are not holding our own for lighting; whereas for heating, cooking, and industrial purposes the development is considerable, and the field larger. The gas industry can occupy and establish itself in this field if its product and selling price are gradually adapted to the altering conditions.

You are misleading in the interpretation you put on some of my statements. For example, you say: "Mr. Newbigging's amiable intention appears to be to completely hand over the consumers of gas for lighting purposes to electricity whether they would or no." This is not correct, because I say: "Gas still required by those who preferred it for lighting, and for street lighting, would be taken from the high-pressure mains, or even the existing mains at a higher pressure than is now maintained."

I am quite content to remain in "a position of splendid isolation in this particular matter," leaving the future to prove or disprove the correctness of the views I have expressed.

J. G. Newbigging.

Manchester, Sept. 24, 1915.

[There is agreement with Mr. Newbigging in his modification of the statement that the Gas Department "will" become the gaseous fuel supplier. There is no article of our faith in relation to the gas industry that is stronger than the one that holds that it is the destiny of the industry to become the supplier of gaseous fuel; but we hope, too, that coincidently it will remain a supplier of gas for other purposes. There is some relief in knowing that Mr. Newbigging is of opinion that "many years" will elapse before the position of the lighting load, and that of the cooking, heating, and industrial load, are reversed from what they are to-day. Our correspondent does not dispute the advantages of gas from the qualitative, efficiency, and economy points of view; but yet he submits that it is only the cost of fitting-up houses that keeps many people from changing-over to electricity. This is a very thin thread indeed between the retention and the loss of custom. Why would they pass over to electricity if it were not for the cost of fitting-up? Is it to gain convenience, and to lose quality? If so, it points to the education of such householders being seriously at fault regarding the advantages of the quality of light. That is the direction in which the gas industry should be up and doing in connection with lighting. Naturally, we must expect the lighting business to become a gradually diminishing proportion of the total consumption, in view of the extension of consumption for heating, cooking, and industrial purposes. No one can have seen the gas industry duplicate its volume of business since electricity has been a public supply, with 40 to 50 per cent. of the total business representing day consumption, without appreciating this fact. However, the statement in the third paragraph of Mr. Newbigging's letter indicates that, in his opinion, the "future" (referred to in the last paragraph) is far distant before the correctness of the views that he has expressed will be either proved or disproved.—Ed. J.G.L.]

Sir,—It is very satisfactory to learn that there is another "revolutionist," besides myself, in the profession, because this is what you styled the writer on the occasion of the delivery of his lecture on low-temperature carbonization at the Manchester University in 1913

What I pointed out then I maintain now, that it is little short of criminal to waste valuable coal by the absolute destruction of some of its most valuable constituents—light oils, heavy oils, and ammonia. But this is what is being done by all processes of high-temperature distillation.

Yes; I know the argument that gas companies' prime object is to obtain the utmost yield of gas per ton of coal. But cannot this effort be purchased too dearly?

At the time, I ventured the remark that electricity was overtaking gas by leaps and bounds, and it was open to the gas companies to meet the competitor in the gateway, before it was too late.

What I endeavoured to point out was that the ultimate function of a gas-works would be to provide the power required by the electricity undertakings, leaving to the latter the distribution and illumination; and to this I believe that it will eventually come. The power required would naturally be by means of power gas as evolved by an ordinary "producer." But I ventured to indicate that, by using raw bituminous fuel in producers, many of the good things which high-temperature carbonization now destroys would likewise be destroyed in a high-temperature "producer." So the idea was propounded that the raw coal should first be carbonized by a "low-temperature" process, whereby the oils and light hydrocarbons of great value would be saved. Some 5000 cubic feet of heating gas, of about 300 B.Th.U., would be obtained, and ultimately a beautiful easily-burning coke, practically all carbon. This when consumed in a "producer" would yield a very large quantity of power gas—infinitely cheaper than steam power; while practically all the ammonia possibly obtainable would be recovered in the form of sulphate. Figures, diagrams, and analyses, on a trustworthy basis, were given to substantiate the writer's views.

Over and over again, scientific societies have pointed out the absolute necessity—now and after the war—of conserving our coal supply and its valuable constituents. That this can only be done by thoughtful attention to the best means of saving the constituents, and upsetting the present fundamentally ruthless methods of destroying them by high-temperature processes.

I maintain that if our industry is based on methods opposed to all scientific and economical laws, such an industry must be modified and revised to fall in line with what may be termed "Conservation *v.* Destruction."

Sporadic ideas and views are of little value. The subject must be tackled by organized scientific investigation; and this seems very difficult of attainment.

F. D. Marshall.

Queen Anne's Chambers, Westminster,
Sept. 22, 1915.

[We agree whole-heartedly with the last sixteen words of Mr. Marshall's letter.—Ed. J.G.L.]

Radiant Heat Distribution.

Sir,—It is quite evident from your reply to my last letter that the discussion will develop into a game of "Hide and Seek" if I permit you to draw me away from your actual statements.

I criticized your assumption that radiation as radiated from a gas-fire can be "concentrated." Whether it is you or I that "play upon words and assumptions" or is "blind to contexts," may be left to the judgment of your readers, after re-rendering the sentence you used (and not your misquotation) as follows: "The real question is which is the best distribution for practical purposes, the more concentrated or the more distributed *radiant* heat." When quoting last week, you left out the word which I have italicized, and which is the whole gist of contention. Had you left it out of the sentence when first used, much ink would have been saved. The whole expression "distribution of radiant heat," which you used on p. 438 when introducing this matter, is a misnomer. Radiant heat *radiates*, which is quite different from *concentration*, the lexicon meaning of which you give, but it in no way helps you in your definition of its use. Radiant heat does not require "distribution;" it distributes itself.

As a large manufacturer of coal-grates, I am in a position to state that for at least the last ten years, the majority of fireplaces sold (including registers, mantel registers, and interiors) have been recessed. My sketch accurately illustrated an ordinary fireplace interior, and not one specially made for the gas-fire, as was the case in the sketch to which you refer.

As you lay emphasis upon a long test for justifying your views on air movement, perhaps you will be good enough to give full details of this, so that others may see how firm is the foundation of your confidence.

Jas. W. Wilson,
[Wilsons and Mathiesons, Limited.]

Leeds, Sept. 24, 1915.

[We fail completely to find, in anything written by way of comment on Mr. Wilson's communications, any endeavour to draw him away from our "actual" statements. It is not generous on his part to continue to ignore the *precise* words employed by us, and to insist on trying to lead readers to suppose that we had spoken of "concentrated" radiant heat when the terms "*more* concentrated" and "*more* distributed" were used comparatively. The word "radiant" before "heat" was not purposely omitted from our comment last week; and seeing that the whole controversy is, and has been from the beginning, on the subject of radiant heat, no reader will have been misled by the inadvertent exclusion of the word from the sentence in question. Mr. Wilson knows full well—at least, we give him credit for doing so, in view of the quotations made last week from his own letters—just as other readers do, what we meant by "*more* concentrated," and "*more* distributed." He tells us he is prepared to leave the matter to the judgment of our readers; we shall be quite content with that judgment. Mr. Wilson's "ordinary" fire-place interior is not the interior that *exists* to-day in millions of rooms. Those that *exist* are the "ordinary" fire-places; the more modern ones that are very gradually being adopted in new and altered houses are not the "ordinary" ones that have prevalence. With reference to air movements which, in Mr. Wilson's mind, will have such unhappy effect upon semi-circular fronted fires, surely, he, as a gas-fire maker, must know the form of tests that a firm of gas-fire makers, with a laboratory and competent technical staff, would employ in putting to trial the point in question. However, he requires "full details" of the tests. Perhaps he will apply to the Richmond Gas Stove and Meter Company, who made them.—Ed. J.G.L.]

REGISTER OF PATENTS.

Cerium-Iron Lighters for Lamps.

Ehrich and Graetz, of Berlin.

No. 13,527; June 3, 1914. Convention date, April 20, 1914.

This cerium-iron lighter for lamps is said to be completely protected from atmospheric influences, and therefore eminently suitable for use in outside lamps where, without it, it has been found that such lighters, for various reasons, soon lose their efficacy.

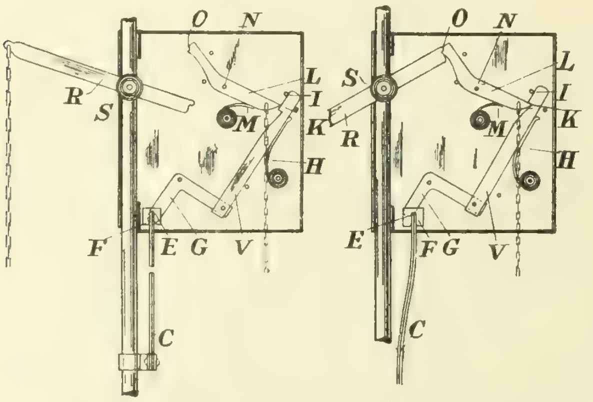
The main feature of the invention consists in the lighter being enclosed on all sides in a completely weather-proof manner, and coming into contact with the atmosphere only at the time the lamp is being ignited. A most important point is said to be that the lighter is completely enclosed during the time the lamps are not burning—"the danger of its being damaged when the lamp is burning, when the lighter is secured near the lamp, being less great on account of the heat of the lamp."

Automatic Closing of Gas-Cocks.

Böhrer, K., and Schell, E., of Hopfingen.

No. 14,143; June 11, 1914.

This apparatus is for effecting the automatic closure of individual gas-taps when the gas supply is shut off at the main cock, and so preventing escapes of gas occurring.



Bohrer and Schell's Automatic Gas-Tap Closer.

The illustration shows the invention applied to a gas-pipe when in the closed position, and during the time of ignition.

Clamped to the gas-pipe is a composite strip C, formed of hard and soft metal, which strip engages at its free end E in a cavity F of an angle lever G. A bar V, pivoted to the lever, is controlled by a spring H and a pin I, and possesses a projection K, in which engages a locking-piece L, held constantly in its proper position by a spring M and supported on the pivot. At its other end is a projection O, which engages with a lever R, the pivot of which actuates the gas-cock, and is surrounded on the outside with a spiral spring S. The entire mechanism is located in a casing fixed upon the gas-pipe.

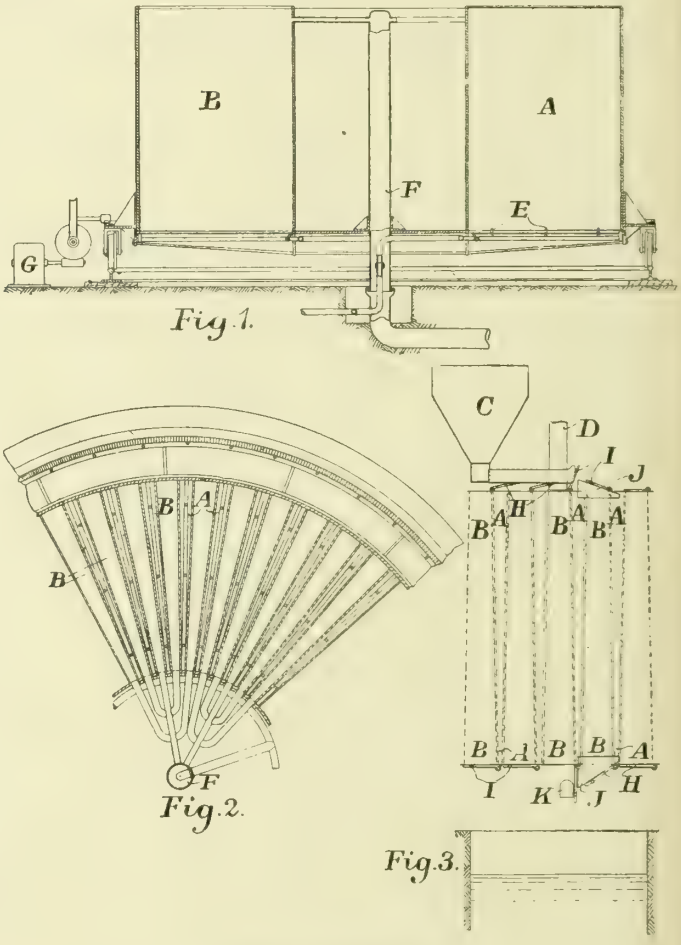
For the purpose of opening the cock, the lever R is drawn downward, and then engages fast in the projection O, so that the gas can be ignited. By means of the uprising heat the strip C moves in the radial direction towards one side, and carries with it the angle lever G, which, in turn, moves the bar V upwards, so that the locking-piece L engages the projection K. In this position, the mechanism remains until the moment of the cooling of the heated strip—that is to say, until the gas is shut off at the main cock. At this moment the strip moves back again and moves with it the lever G and the bar V, so that the locking-piece L releases the cock lever R, which moves back into its original position and closes the pipe. There is attached to L a chain, which releases the cock lever by drawing down the locking piece, so that the cock can be closed also in the ordinary manner.

Furnaces for Distilling Carbonaceous Substances.

Crawford, W. W., of Westminster.

No. 18,437; Aug. 8, 1914.

This furnace for the destructive distillation of bituminous coal shales and the like is of the type in which a plurality of retorts are disposed about a common axis, and arranged to rotate. Rotary coal distilling devices of this type are known, the patentee points out; but rotation in such cases has been for the specific purpose of bringing successive retorts under the more concentrated influence of a heating device disposed at a stationary point outside the rotary part. The present invention consists of a series of retorts and inter-retort heating chambers; the retorts and chambers, together with the heating means therefor, being revoluble and radially disposed about a common axis—rotation being necessary for the purpose of automatically charging and discharging the contents of the retorts, and allowing, by a variation or a setting of the speed, to apportion the time for coking as may be desired.



Crawford's Rotating Retort.

Fig. 1 is a part sectional side elevation. Fig. 2 is a part sectional fragment of fig. 1 in plan. Fig. 3 shows the detail of the charging and discharging gear in part side elevation (detail not material to the above functions being omitted for the sake of clearness).

The operation of the invention is as follows: The furnace as a whole is filled with the carbonaceous material to be distilled—an operation preferably effected by employing the hopper C and cutting out the action of the plunger D. Gas is now turned on and the burners E lit within the furnace chambers—the hot gases of combustion passing upwards and heating the walls of the retort chambers B. The gases may either be allowed to escape into the atmosphere or, if desired, may be collected at the top of the chambers A. In some cases it may be desirable to mix the gases with the products of distillation, in which case connection may be made between the chambers A and the duct F. The motor G is started after a sufficient time has elapsed, and the furnace as a whole rotates. Distillation takes place in the chambers B by means of the heat transmitted through the walls; and gases as distilled pass through pipes into the central duct F, whence they are drawn off, the process continuing until the whole of the constituents recoverable at the temperature produced by the burners are obtained. "With this type of furnace the carbonaceous contents can be distilled at a very low temperature; the effect being to produce a minimum of gas and a maximum of oil and tarry matters."

As the furnace rotates the retort doors H at the top and bottom open, owing to the projection I engaging with the plates J K, and the plunger D is actuated to discharge the contents. Immediately the projection I has passed the lower plate K, the lower door closes while the upper one remains open—allowing a charge to enter the retort. Directly the upper door H has passed the hopper mouth, it closes; and distillation proceeds until, in the course of the revolution of the furnace, the retort returns to the discharge station and the operation is repeated. The outward flaring of the retort chambers B materially assists the discharge; a comparatively small amount of power imparted to the plunger being sufficient to drive out the contents.

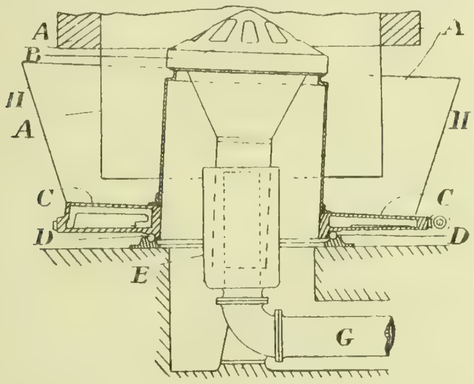
The desired end is to obtain a distillate over a comparatively low temperature—say, 300° to 600° C.—but by increasing the size of the chambers A and the numbers of the burners E, distillation may take place at any desired temperature. Also, by increasing the size of the plant, charging and discharging may take place a plurality of times per furnace revolution; but whether a single or multiple discharge per revolution be employed the speed of rotation controls to a great extent the temperature of distillation, and "speed therefore is a very convenient assistant or auxiliary control to the working of the furnace."

Grates of Gas-Generators.

R. & J. Dempster, Limited, and Beard, G. F. H., of Manchester.

No. 9413; June 28, 1915.

This invention—relating to the grates of gas-generators used for the manufacture of water gas—has for object to provide "a simple and effective combination of grate and trough . . . whereby desirable movement may be imparted to the material in their neighbourhood."



Beard's (R. & J. Dempster) Gas-Generator Grate.

The illustration (a sectional view of one form of upright grate and adjacent parts of the producer) shows an ash receptacle or water-trough mounted about the grate. A is the lower portion of a producer; and B the upper part of the grate, the outer walls of which are in connection with an inclined plane C, so that the axis of the grate is perpendicular to the plane or is not perpendicular to a horizontal plane. The inclined plane forms the upper surface of a base which is capable of rotation about a horizontal plane by being mounted on ball-bearings D, and by being provided with a worm wheel (all round the circle forming the periphery of the base) which is in gear with, and capable of operation by, a worm.

The inner part of the grate is partly within an open socket piece E, for containing water to form a seal, in connection with the pipe G—enough clearance being provided within the socket piece to allow free movement, without interference with the internal connection between the pipe and grate. An extension of the pipe terminates at a level above that of the water (not indicated) in the piece E. A water-trough or ash or like receptacle H is indicated, the axis of which is not perpendicular to a horizontal plane, attached to the surface C of the base, so that one part of the base of the trough is lower than another.

The movement of the grate, due to its mounting upon the rotary base, will, during rotation, have a disturbing effect upon the material about the grate, which will facilitate the fall of the material at different points as the base revolves. Added to this the ash in the trough will tend to accumulate at the lower portion of the bottom, with the result that it will pass underneath the depending wall (within the trough) of the producer, and eventually cause other ash or material above it on the outside of the wall to pass over the upper edge of the trough, "without the necessity for the use of barriers or the like commonly used for this purpose."

Condensing the Volatile Gases Distilled from Carbonaceous Material [Peat].

Prioleau, J. R. H., & W. L. St. J., of Chelsea, S.W.

No. 23,165; Nov. 27, 1914.

This invention—of especial application to the distillation and coking of peat—relates to a method of carrying and condensing the volatile gases distilled from carbonaceous materials in a retort, with the object of obtaining the several gases quickly at the lowest temperature consistent with the evolution of the volatile matters without injury, and to obtain gases given off at different temperatures at the same time.

It has previously been proposed, the patentees mention, to traverse the materials through a closed retort and to draw off the volatile gases at several points in its length, either into a common flue or separately; the gases being thereafter carried away for further treatment in various ways—for instance, to render them suitable for heating the retort. In certain cases also heated air blown through an injector has been used for the removal of the gases without condensation; and the gases have thereafter been passed through condensers for the extraction of some of the distillates present.

The invention is of this class, and the patentees propose to employ means for continuously traversing the carbonaceous materials through a hermetically closed single chamber retort, subject to surface heating only, but having an ejector condenser, or a series of ejector condensers, directly and closely, but separately, connected to the interior of the retort, and operating by means of a non-condensible, or substantially non-condensible, gas at a low temperature, so as to cause suction on the gas producing retort at a given point, and immediate condensation of the gaseous matters thus drawn into the condenser, by reason of the low temperature of the non-condensible gas.

By connecting the series of separate ejector condensers to the gas producing retort at successive points in its length, or by connecting thereto (either continuously or at intervals) a separate condenser pipe, or chamber, substantially parallel to the retort, different volatile matters distilled at the several successive points, corresponding with the temperature ruling at these points, may be withdrawn from the retort simultaneously and their condensible portions immediately recovered.

Further, the drawing off of the gases is carried out without them having to pass through other zones of the retort, either hotter or colder—"a point of material advantage, as such passage would subject them to 'cracking' or decomposition conditions which might alter them chemically"—thus the resultant oils would be different.

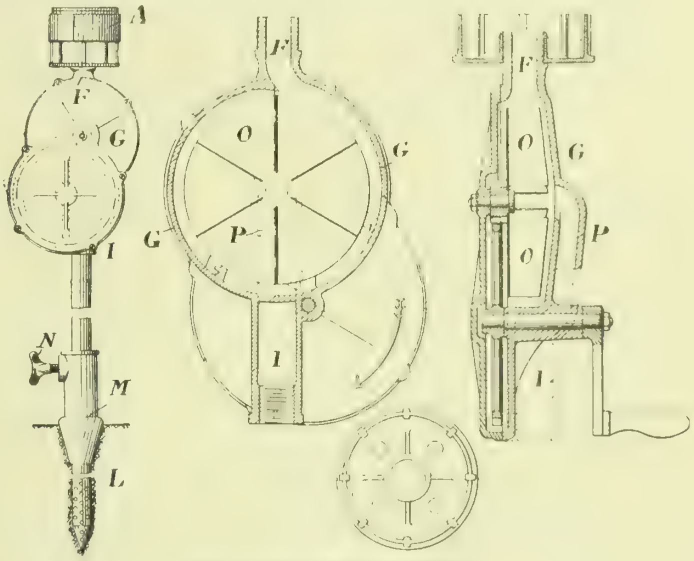
Preferably a horizontal retort having a conveyor screw is employed, and preferably also non-condensible gas evolved from the carbonaceous material will be used for the condensing element in the condensers—the same gas being used over again after passing it through purifying and cooling apparatus, by means of a pump or other suitable mechanism.

Indicating and Locating Gas Leakages.

Tully, C. B., of Queen Victoria Street, E.C.

No. 2781; Feb. 20, 1915.

This invention is said to relate to "that class of means whereby an elastic fluid is pumped through a pipe system into the presence of a device adapted to determine its composition or to detect contamination; and it has for its object to provide a simple and efficient portable instrument for indicating and locating gas leakages from mains." This is effected by combining with a suitable form of instrument adapted to give an indication of the presence of gas, a hand pump (provided with a suction pipe for its support) that can be inserted into the ground in the neighbourhood of the portion of the gas-main to be tested—the delivery mouth or pipe of the pump discharging to the receiving portion of the indicating instrument.



Tully's Gas-Leakage Indicator.

One way of carrying the invention into effect is illustrated by an elevation of the appliance viewed from the rear; also a part sectional front elevation of the pump (to a larger scale), and a vertical transverse section.

A represents an instrument depending for its action on a diffusion of the gas through a permeable septum (such as unglazed terra cotta) into an enclosed chamber, causing the movement of an index over a dial. This instrument is carried by an adapter having a plate bottom with milled edge, and a central screw threaded boss capable of being fitted to the delivery branch F of the pump. The plate has perforations in it, so that the gas withdrawn from the ground and delivered by the pump can—after impinging upon the porous septum—escape. The suction branch I of the pump is in alignment with the delivery branch F, and is removably secured to a length of tube which is pointed and formed with perforations L. The tube may be provided with a tapered collar or tubular plug M, whereby a sufficiently tight joint can be made between the tube and the mouth of the hole in the ground in which it is inserted. A set-screw N will permit the position of the plug being altered if desired.

The pump comprises an exhausting fan O, to the eye of which fluid from the suction branch is conducted by a passage P. The fan (driven by gearing from a handle) has a series of (say) six thin metal vanes radially arranged and fitting the surrounding casing loosely, so that when the pump is operated a steady, gentle stream of fluid will be supplied to the gas detecting instrument.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The Clackmannan County Water and Glasgow Water Order Confirmation Bills were last Wednesday brought from the Commons, read the first time, and—pursuant to the Private Legislation Procedure (Scotland) Act, 1899—deemed to have been read a second time and reported from the Committee.

HOUSE OF COMMONS.

The Clackmannan County Water and Glasgow Water Order Confirmation Bills were last Wednesday read the third time and passed.

London Lighting.

Answering questions put last Thursday by Sir C. Kinloch-Cooke in regard to this matter, Sir John Simon said: The regulation of lighting in the Metropolitan area, with a view to minimizing risk from air raids, has been most carefully studied by the expert officers of the Admiralty, and the scheme adopted by the Home Office and the police authorities is based on their advice, and is the result of repeated observations alike from the air and from the ground. The main object to be aimed at is uniformity rather than absolute darkness; and it is a matter of great importance that the scheme should be applied equally in all parts of the area—exceptional darkness being as likely to prove a distinctive mark as exceptional brightness. Private citizens and local authorities have shown themselves generally willing to accept the application of the scheme, and the lighting orders made to give effect to it; but as some cases of local departure from the scheme have come to my notice, I am proposing to make a fresh order defining more exactly some of the requirements—as, for instance, in the matter of the lights in private houses—and giving the police increased power to enforce it.

Five Months' Local Loans.

Last Wednesday, Sir Edwin Cornwall asked the President of the Local Government Board if he could state the amount of loans sanctioned by his Department during the period March 26 to Aug. 31, 1915, during the same period in 1914, and each of the financial years ended March 31, 1913 and 1914.

Mr. Long, in reply, said: The amount of loans sanctioned by the Board during the period March 26 to Aug. 31, 1915, was £2,091,402, and during the same period in 1914 £7,412,277. During the financial years ended March 31, 1913 and 1914, the total loans sanctioned were £12,795,285 and £15,178,255 respectively. I should like to add that of the £2,091,402, over £1,350,000 was for war requirements—such as the provision of electrical and gas power, housing for munition workers, hospitals, &c.

LEGAL INTELLIGENCE.

APPLICATION REGARDING A MANTLE FABRIC PATENT.

Position of a Berlin Firm.

Last Tuesday, in the London Patents Court, the Comptroller heard an application by Mr. Thomas Bromley, of the firm of Mellor, Bromley, and Co., of Western Road, Leicester, that patent No. 23,650 of 1903, held by Messrs. Henry Hill and Co., of Berlin, should be suspended or rendered void, by reason of the fact that it was held by an alien enemy firm. The patent is one for the manufacture of a machine for knitting fabric essentially for the construction of incandescent gas-mantles. The application was opposed by Messrs. Hill and Co.

Mr. Gordon, who appeared for Mr. Bromley, said the fabric which was knitted by the machine in question was of such quality that it had an exceptional reputation throughout the world. It was consequently greatly in request. It was a matter of much importance that the British market should be amply supplied with this fabric; but having regard to the fact that the licence for the patent of the machine which made it was held by a firm in Germany, this demand was not supplied. Therefore he asked that the licence should be suspended in his favour, so that his firm, who were perfectly able to do so, might manufacture the machine, and meet the demand for it and the fabric that it wove. The application was supported by the Volker Lighting Corporation and others.

Mr. Watson, for Messrs. Hill and Co., argued that the licence for the patent should not be suspended. In the first place, he said, it was not proved that the firm was an alien enemy firm—at least, it was not clear in the words of the Proclamation. Henry Hill and Co., of Berlin, was mainly run for the benefit of English shareholders. It was true that the majority of the share capital was held by an Austrian firm; but this firm was under the control of the United States Debenture Corporation, of which the shareholders were English.

The Comptroller: But the point seems to be that we cannot get the fabric for the mantles in this country. It does not matter how many shareholders are here in England, if the machine is made in Germany.

Mr. Watson: It all depends on who owns the patent.

The Comptroller: In ordinary times it might; but now it does not. What can English shareholders do if the machine is produced by Germans who cannot export it to England?

Mr. Watson said he could adduce evidence to show that the Welsbach Company were prepared to manufacture the fabric, and would meet the demand in this country, and that Messrs. Henry Hill and Co. were prepared to allow them to make the machine. The Welsbach Company were therefore masters of the situation; for they had it in their power to make the machine.

The Comptroller: This is the first I have heard of the Welsbach Company.

Mr. Watson: I ought to have said that the Welsbach Company really hold the controlling interest in the Austrian firm I have spoken of, subject to a charge on the shares which the United States Debenture Corporation have.

The Comptroller asked if the Welsbach Company were to apply for the licence?

Mr. Watson replied that he did not think so.

The Comptroller said it seemed from the evidence that the supply of this fabric for mantles was cut off, and therefore the demand must be met by some other means. Would it not be sufficient, even without evidence of any great demand, to show that the German Company who held the patent could not export the machine, to warrant him saying that the licence should be suspended in favour of somebody who could make the machine?

Mr. Watson thought not. He also argued that whatever demand there was for the fabric was fairly met, and that the evidence showed the demand for the machine was not such as would justify the suspension of the licence to the German Company.

Mr. Gordon, in reply, said the machine was used solely for the manufacture of the fabric in question. The evidence of Mr. Ashton, of the Volker Lighting Corporation, proved this, and that there was a great demand for the fabric. He suggested that there was no evidence to support the suggestion that the Welsbach Company could meet the demand.

Mr. Watson said he would ask for an adjournment to produce the evidence.

The Comptroller remarked that there was a question whether the Welsbach Company would not be infringing the patent if they produced the machine. After hearing other arguments, he said he would consider the matter and report in due course.

LIABILITY OF PREPAYMENT METER CONSUMERS.

Agreements Exempt from Stamp Duty.

At the Farnham Petty Sessions, on the 2nd inst., Mrs. A. Ward, of Ash, was summoned by the Aldershot Gas, Water, and District Lighting Company for payment of £2 7s. 5d. for gas supplied between Feb. 10 and Aug. 6 last.

It was stated that the prepayment meter through which the gas was supplied was in a lock-up shop. It showed that £2 8s. had been put in; but the meter had been broken open, and the money abstracted. An agreement accepting responsibility for safe custody of money in the meter-box, and undertaking to make good any deficiency found on collection, had been signed by the defendant, who did not appear to contest the case. The Magistrate's Clerk expressed the opinion that the agreement could not be produced in Court, as it was not stamped. If it were relied upon in connection with criminal proceedings, it would be a different thing. He read a letter from Mrs. Ward, in which she said that, as she had already paid for the gas, she was not in the Company's debt. Her husband was an officer at the front; and she had no separate estate. In the course of another letter, addressed to the Company, she said: "You fixed the meter in February last; and from that time you have never collected the meter-box money, although your people have repeatedly been requested to do so. One man did call and count the money, and returned it to the meter. What was the reason for the money not being collected monthly? Your people were frequently doing gas-stove repairs on the premises; and you knew the shop was a lock-up one." On behalf of the Company, it was explained that the reason why the money had not been collected was that a wrong address was given on the form. The meter was installed by another department of the Company at Farnborough; and the collector could not find the premises where it was fixed. The Clerk intimated that he had advised the Bench that the agreement could not be produced. It was for the Company to show that they had power to do so under their Act. That this might be done, the case was adjourned for a fortnight.

When the matter was mentioned again on the 16th inst., Mr. Norman Clinton, who appeared for the Company, said he believed the Clerk had meanwhile satisfied himself that the agreement was exempt from Stamp Duty, and therefore could be put in in evidence. The Clerk said that was so, though there was no case bearing directly upon the point. Mr. Clinton remarked that naturally a company like this, starting in a large way to supply gas by automatic meter, communicated with the stamp authorities, and were assured by them that no stamp was required. Therefore the agreement could be put in; and by this the defendant undertook to refund any deficiency in the meter money-box. Mrs. Ward had now paid the amount of the claim; and he asked also for the Court costs. These the Magistrates allowed.

Synthetic Gas Processes.—With a capital of £5000 [in 2500 preference participating shares of £1 each and 50,000 ordinary shares of 1s. each], Synthetic Gas Processes, Limited, has been registered to acquire any invention for the treatment of coal before or during carbonizing, to improve the yield of volatile products and the quality of coke produced, and the production of gases from coke, or the treatment of any products resulting from the carbonization of coal. It is a private company. The number of Directors is not to be less than two, nor more than three. The first are J. K. Welch, A. Rollason, and R. Doncaster (Secretary). The registered office is at No. 31, Station Street, Nottingham. Particulars of the process in which the Company are interested will be found in last and this week's issues of the "Journal" [pp. 635, 696].

MISCELLANEOUS NEWS.

SOME COMMERCIAL ASPECTS OF THE GAS BUSINESS.

The American Commercial Gas Association's Contribution to the San Francisco Gas Congress.

Under this heading last week [pp. 653-5], abstracts appeared of such of the papers contributed by members of the American Commercial Gas Association to the International Gas Congress, San Francisco, as were at the time available. A few more have since been published; and they are abstracted below.

Gas Street Lighting.

By George S. Barrows.

The requirements for street lighting—viz., reliability, sufficient illumination, and appropriateness—are discussed.

The reliability of artificial gas as at present manufactured and distributed, when used with either open-flame or modern incandescent mantle burners, is shown to have attained a high degree of perfection. The various means for transforming the energy of gas into light by open-flame burners or incandescent mantles of different types, the means used for protecting the lamps by globes, and the methods employed for lighting and extinguishing lamps, are described. The utilization of high-pressure lighting is also briefly referred to.

The object of street lighting and means for attaining the ends sought are next enumerated.

Attention is called to the value of appropriate designs of lanterns and posts, and photographs of recent installations of gas-lamps, with data regarding the illumination of them, are given.

Office and Store Lighting by Gas.

By Thomas Scofield and Oscar H. Fogg.

Great advances have, the authors say, recently been made in the development of incandescent gas lighting. Until the last few years, there were but few sizes of incandescent lighting units on the market; but now there is a complete equipment of types and sizes of inverted and upright incandescent gas-burners at the disposal of the engineer. Coincident with these developments in burners, came a marked improvement in fixture design. Far removed from the old conception of "gas-fixture," as all that is ugly and inartistic, is the modern gas-fixture. Designs of gas-fixtures are now all that could be desired. Illustrations show the fixtures, for semi-indirect and direct lighting, that are adaptable for store and office lighting.

Requirements for this Class of Lighting.

In office lighting, "lighting" means correct lighting in a commercial sense, for which it has to be designed with regard to efficiency, quality of light, economy, dependability, and appearance. Modern gas lighting gives correct lighting, as the actual installations illustrated have conclusively proved.

Store lighting has the same general requirements as office lighting. More consideration has to be given to appearance than in office lighting; the quality and colour of the light, as a medium for the display of goods, are more important, and the dependability more necessary.

In addition to the elements of efficiency, quality, and colour of light, dependability of service and appearance, which are advantages of gas lighting particularly applicable to store and office lighting, there are many more advantages which this illuminant possesses that apply to all classes of lighting. Some of these are: Its acknowledged hygienic value, purifying the air; the fact that in radiant energy given off, candle power for candle power, it does not differ from electricity; the recently proved fact that it does not reduce the oxygen content of space illuminated; its flexibility and the means of distant control and ignition now available.

The requirements which have to be met, in the subdivisions of the main classification, and "how successfully gas is meeting them in most modern installations," are dealt with at length.

Office Lighting.

The following classifications are those into which office lighting naturally divides itself (say) in a large office building:

General office lighting—Large office spaces for general clerical work.
Private office lighting—Small offices occupied by one, two, or three persons, board-rooms, &c.
Drafting room lighting.
Hall and corridor lighting.

General Office Lighting.—The illumination to be provided in this class is for clerical work over a large area; and general illumination is the modern solution.

The requirements are rather exacting. The intensity of illumination has been found to vary through a wide range, and also in respect to the system of lighting chosen. With the semi-indirect system, a slightly higher intensity is necessary. Generally, the range of 3 to 5½ foot-candles will cover any case in this class. Shadows have to be eliminated, and the illumination must be uniform and well diffused. These qualifications are obtained by the correct spacing of the semi-indirect or direct lighting units—much more effectively, however, with the semi-indirect units.

Specular reflection and glare are to be avoided. These are less liable to be produced with the incandescent mantle than with the modern electric incandescent unit. This is due to the low intrinsic brightness of the incandescent mantle, as compared with the incandescent electric unit—the ratio being 1 to 30.

The quality of the light is important, as concentration on fine work is often required. Gas is the least fatiguing illuminant to work under, and besides has great daylight qualities.

Illustrations are given showing clearly the use of gas for this class of office lighting. They are typical of the best modern practice, and illustrate the modern treatment of large general office spaces, with both the semi-indirect and direct lighting systems.

Private Office Lighting.—This class of lighting generally means the illumination of a comparatively small area occupied by a single person, although the same space may have two or three occupants and still be in the same class. It proves more exacting in its requirements than lighting a general office space—due to the personal preference of the occupant and other considerations. The intensity required is from 2½ to 4 foot-candles.

The general requirements are the same as for general office lighting. There are many reasons why wider variations occur in this form of lighting, besides those due to the personal equation of the occupant. A private office may be occupied by one person having one or two desks, and nothing else requiring a working intensity of illumination. The same size space may, in addition, contain filing cabinets, safes, maps, &c., along the walls, making a different lighting treatment necessary. If two or three persons occupy the same space, it will again change the layout of outlets, fixtures, &c.

Semi-indirect lighting, with its remarkable diffusion and softness, absence of glare, and decorative possibilities, is most satisfactory—although direct lighting, when correctly installed, is suitable and in many cases obligatory.

Illustrations show clearly how successfully the modern gas lighting equipment and accessories are meeting this wide range of requirements. These illustrations cover the divisions of private office lighting, as previously pointed out, and show semi-indirect lighting with both local control and pilot ignition, and magnetic control from the wall switch; also direct lighting, made necessary by local conditions, and semi-indirect lighting obtained from a multi-light direct lighting fixture, with bowl-shaped shades and small upright units.

Drafting Room Lighting.—This lighting is essentially the illumination of large areas similar to general office lighting; but it has a few requirements peculiar to itself. The intensity must be high, the diffusion perfect, and the distribution uniform. With the high intensities required, the absence of glare and specular reflection is very important. The quality of light is of extreme importance, in order to prevent eye strain. Modern incandescent gas lighting meets these requirements, especially with the semi-indirect system. The intensity in this class of work is found to vary between 7 and 10 foot-candles.

An illustration of a typical gas-lighted drafting room is shown. The semi-indirect system is used, and the illumination received on the drafting tables is 8 foot-candles.

Hall and Corridor Lighting.—The gas lighting of halls and corridors of office buildings presents few difficulties for solution. There are two divisions of this class of lighting: First, lighting the ordinary office building hall; second, lighting the main corridor containing special decorative features. In the first case, direct or semi-indirect lighting, properly designed, is entirely satisfactory. In the second case, the lighting units should be designed to form part of the decorative scheme. The intensities required vary from 5 to 2 foot-candles.

The characteristic of gas lighting which makes it especially suitable for this work is its close approach to daylight colour value; since it has to be used to augment daylight, and, therefore, gives the best possible effect.

Illustrations are given showing modern semi-indirect lighting applied to typical corridor lighting, and showing semi-indirect lighting with decorative units used to light a lobby.

Store Lighting.

For the purpose of the paper it had been deemed best to make three general sub-divisions of store lighting—each one treated in a broad way, and a few typical illustrations given of gas lighting for each class. The following classification is used:

(1) Lighting of small stores.
(2) Lighting of medium-sized stores.
(3) Lighting of large stores.

Small Stores.—In this class will come such stores as art, book, cigar, music, notion, post-card, stationery and delicatessen stores, barber shops, bakeries, haberdashers, tailor shops, &c.

This type of store is generally owned by persons of limited means who require an economical lighting installation. On this point alone, gas has a great advantage over any other illluminant. Besides it has several other advantages, inherent in all forms of modern gas lighting; and for these reasons we find large numbers of small stores gas lighted, since gas can best meet the requirements of a simple, moderate-priced installation.

Each kind of store will have definite requirements peculiar to itself. Since this is true, and since local conditions play an important part, only the broadest statements can be made. The intensity of illumination required can be said to vary from 2 to 4 foot-candles. Usually the space to be illuminated is long and narrow, making one central line of lighting units most desirable. The direct or semi-indirect systems can be used; but direct lighting is in greater favour for this class of work. Some typical examples of small store lighting, by gas, are shown in the illustrations in the paper itself. These show both semi-indirect units and direct lighting units, of the large mantle inverted type, successfully meeting the requirements of this class of lighting.

Medium-Size Stores.—Under this classification will be found such stores as butcher, china, cloak and suit, confectionery, drug, grocery, hardware, hat, leather, piano, shoes, florists, millinery, &c.

As these stores are generally owned by persons better equipped financially than in the case of small stores, more thought can be given to the advertising and decorative value of the lighting installation, which can here be treated as part of the store furnishings. The interior of the store must be made attractive not only to those who have already entered, but to those glancing in from the exterior.

Gas lighting with modern units suits the conditions so well, that the authors find an ever-increasing number of establishments of this class becoming users of this means of illumination. Due to the artistic and attractive appearance of the gas semi-indirect units now on the market, this type of lighting is becoming very popular. It has proved to meet the requirements of medium-sized store lighting with entire satisfaction. Purely local conditions govern the intensity of illumination required;

but a range of 2½ to 6 foot-candles can be said generally to cover this class of work.

The modern treatment of these stores is clearly shown in a series of illustrations, which give examples of typical semi-indirect and direct lighting installations—"all of which not only furnish suitable illumination, but supply certain advertising features tending to draw customers into the store."

Large Stores.—Large stores will comprise such establishments as clothing, dry goods, furniture, furrier, jewellers, department stores, &c. This class requires the most careful consideration of the advertising and decorative features of the lighting installation. Gas has successfully met these exacting demands, in most cases with the semi-indirect unit. But in some cases, due to local conditions, it has been advisable to use the modern direct lighting gas unit. One great advantage that gas possesses is its absolute reliability—giving no possibility of sudden failure of the lighting service on a busy evening. This has been realized, and, with the other advantages of gas lighting, has gained many installations in large stores. The intensity varies, but a general range is from 3 to 7 foot-candles.

The illustrations of modern gas lighting, in large stores, as prepared by the authors, "show clearly the popularity of this lighting medium, with both the semi-indirect and direct lighting units."

Window Lighting.

Directly connected with the interior lighting of stores is the subject of show-window illumination. This class of lighting has peculiar requirements. The primary object is to make the display of merchandise the prominent feature. Again, the means of lighting must be concealed from view; and the goods must be lighted from the proper direction.

The intensity of illumination varies through quite a wide range. Since window lighting is purely an advertising feature, the intensities required can be said to fall within the range of 10 to 30 foot-candles—local condition and the colouring of the goods displayed influencing the intensity to be used.

The daylight value of gas is especially advantageous for show-window lighting, where the goods are best displayed in their true daylight colour values. With gas lighting for show windows, any of the forms of control and ignition can be used, as well as several forms of automatic regulators, which can be set to turn the window lighting off at any prescribed time. Convenience and flexibility of the gas units, with the advantage of colour value, have made them especially desirable for this work.

The two forms of installations now in general use are: First, the separate inverted gas units placed at the front and top of window, equipped with angle reflectors and hidden from the front by opaque material, such as a curtain; and, second, placing the units with conical reflectors over a transparent deck or false ceiling having translucent glass panels. In both cases the units should also be concealed from sight, when viewed from within the store.

The illustrations to this section of the paper show a few examples of good window lighting by gas, using the two methods.

Conclusions.

Summing up their paper, the authors say they have endeavoured to discuss, in brief, the many different phases of office and store lighting in general; and it has been attempted to show how modern gas lighting can meet these requirements, while a few illustrations have been presented to show how successfully modern gas lighting is accomplishing these very things.

Industrial Gas Lighting.

By Robert Ffrench Pierce.

The illumination of factories is a particularly fertile field for the sale of gas, since the refinements of control and the decorative possibilities which favour the selection of competitive illuminants in other fields are of little or no consequence in factories, while economy (the strongest competitive feature of gas lighting) is a weightier consideration than in any other class of illumination.

Manufacturers are being aroused to the economic benefits of good lighting, and are in a receptive mood. A recent census by the National Electric Light Association showed that 164 out of 209 manufacturers replying had recently made changes in their lighting systems, of whom 31 stated that their product had been improved in quality thereby, while 60 reported an increase in output. Only 7 stated that no results were apparent.

Reports of accident insurance companies show that faulty illumination is responsible for a large proportion of industrial accidents.

The increased expense of operating adequate lighting systems as against inadequate systems does not in the most extreme cases exceed 5 per cent. of the wages of the operatives, and is often actually less than that of the inadequate systems—due to the elimination of useless waste by scientific design, and substitution of more efficient appliances. In any event, a very small increase in production, with practically fixed operating expense, will justify any expenditure likely to be encountered in improving lighting conditions.

Although electricity is available to large factories at comparatively low costs, a careful analysis will usually show that an economy may be effected by the use of gas. Some of the largest and most efficiently operated modern factories have been converted to the use of gas for lighting by active cultivation on the part of aggressive gas companies, and under conditions which indicate that equal opportunities exist in most situations.

In order to secure marked beneficial results from the remodelling of a lighting system—results which will be apparent in the increased productiveness of labour—it is necessary to correct many glaring faults of practically universal occurrence in present-day practice. The worst of these is the production of eye-strain, due to glare from bright light sources or polished metal, woods, or other glossy materials. In general, it may be said that good practice demands that the brightness of light sources, visible either directly or by reflection from a glossy surface, should be as low as practicable.

It is necessary to observe proper spacing relations and care in the selection of size of lamp in order to secure adequate uniformity of illumination. It is rarely permissible to space lamps more than two and a half or three times the height above the working plane. The space above the level of the lamp should be sufficiently lighted to avoid unpleasant contrast with the light source.

General illumination of adequate intensity may usually be secured with a gas consumption of 0·01 cubic foot per hour per square foot of floor area, provided local illumination at machines, benches, desks, &c., is also provided. In the absence of local lighting, the gas consumption per square foot for general lighting should be increased to from 0·015 to 0·03—depending upon the class of work, &c.

Local illumination is applied to such a variety of uses that no general directions can be given. The proper arrangement may be determined by calculation or experiment. In all cases the shielding of the workman's eyes from the glare of the light source is the most important consideration.

The elimination of vibration is best secured by proper proportioning of pipe drop or brackets assisted by weighting, if necessary.

Due attention should be given to fire hazard and lamps protected accordingly.

Generally speaking, factory lighting business demands the attention of a specialist, if good results are to be anticipated.

Semi-Public Lighting.

By T. J. Litle, Jun.

The author essays to show the recent progress in gas illumination, calling attention to the fact that indirect and semi-indirect systems are highly desirable on account of the low cost of this illuminant. Attention is drawn to the fact that semi-public lighting is a valuable publicity asset to the lighting company; also to the fact that the public criticizes and judges the merits of a lighting system largely through its public lighting. Attention is drawn to the desirability of obtaining sample semi-public installations on any new illuminant, in order that satisfactory conclusions may be drawn as to its acceptability by the public. The paper touches upon the fundamental principles to be observed in obtaining good illumination in such places.

The semi-public installations are classified, and suggestions are given for the proper types of units to be used in such places.

A new indoor unit is described which is equipped with three miniature mantles mounted upon an upright bunsen. This type of burner is destined, the author claims, to revolutionize incandescent gas lighting, not only because it readily meets various installation requirements (particularly on old fixtures), but also operates well on varying gas conditions; and the mantle losses heretofore encountered in transportation are eliminated because soft mantles are employed. A number of installations are then described and photographs of them given. Some of the installations are criticized as typifying poor illuminating engineering practice.

Outdoor lighting in such places as railway stations, &c., is touched upon and illustrations given. Other new units, such as the large size single mantle lamps and the single burner cluster units, like those used in semi-indirect fixtures, are described. The desirability of spectacular outdoor installations is explained, and the lighting of the tennis course and the golf putting course at the Woodbury Country Club is illustrated.

A great deal of stress is laid on the necessity for auxiliary lighting in all buildings where large numbers of people are apt to congregate—such as schools, churches, play houses, &c. A general outage in a single lighting system in such places at night when the building is crowded usually results in a more or less serious panic, and local authorities have in many cases made auxiliary lighting compulsory; it being explained that the auxiliary lighting be provided to furnish a certain proportion of the total illumination required and be used whenever the building is occupied at night—distinguishing it from an emergency system which might be brought into use should the main lighting system fail.

Buoy and Car Lighting.

By George E. Hulse.

This paper describes the use of Pintsch gas and acetylene for the lighting of railroad cars and aids to navigation. It gives a brief history of the application of the gases to these purposes; the reasons for their special advantages for this work; and the method of manufacture of each. The necessary equipment for utilization is also described, together with the types of burners used, and the results obtained as to illumination and service.

FACTORY AND WORKSHOP LIGHTING.

Further Notes on the Appendices to the Committee's Report.

A continuation is now given of the notice of the appendices which accompanied the first report of the Home Office Departmental Committee on Lighting in Factories and Workshops. Earlier appendices were outlined in the news columns of the last two issues of the "Journal" [pp. 596, 657]; while two of them will be found reprinted in full on p. 643 last week, and pp. 706-7 of the present number.

Lighting and the Eyes.

One of the appendices consists of a summary of replies from ophthalmologists and ophthalmic surgeons to several questions put to them by Mr. F. Richardson Cross, F.R.C.S.; and some reference to these answers was made a fortnight ago [p. 565], in our "Electricity Supply Memoranda." The questions were sent to about 300 oculists or medical men interested in the subject, with a request for information; and the replies summarized were those which seemed likely to be of service to the Committee, or which suggested that trouble, or even slight ailments of the eyes, might sometimes be caused by insufficient or imperfect lighting. About nine-tenths of the whole number of answers indicated that the writers had no knowledge of mischief to the eyes as being directly due to defects in lighting. The evidence is therefore, it is remarked, negative as regards any definite damage to the eyes being caused by faulty lighting. At the same time, it is quite obvious that good lighting is more comfortable to the worker, and would be likely to materially improve his output.

The questions asked were four in number. The first was: "Have you any statistics or opinions which will give information as to the prevalence of eye trouble, slight or serious, occurring in, or depending on, any trades of which you have special knowledge?" The next was, "Is any particular protection of the eyes advisable in any of these?" The third question was in these terms: "What arrangements for proper or artificial lighting are made in the workshops, and how would the illumination be practically improved in any special trades to the best general advantage of the workmen?" The final question was: "What kind of artificial illuminant is in your opinion the most satisfactory, and how is it to be best arranged, so as to avoid either shadow or glare?"

The substance of many replies was given in the previous reference to the matter, just alluded to. It was stated then that, "although gas lighting has such extensive use in factories and workrooms, there is not a single instance recorded of complaint having been made to the ophthalmologists of this system of lighting. Several of the replies, however, mention complaints of people working under the electric light." Mr. Allan Rutherford, M.B. [who deals almost exclusively with gross cases of irritation, such as Siemens and Bessemer steel making and other processes], has never met a case asking for compensation due to any eye disease from light or glare in the works; while Dr. P. A. Harry states that weaving is very trying with artificial light. Mr. M. Stephen Mayou, F.R.C.S., referring to his hospital work, mentions that compositors are particularly difficult to do anything for satisfactorily, owing to the nature of their work, which is often very badly illuminated. While admitting that he has not had experience with factories, Mr. Robert Jacques, F.R.C.S., expresses the opinion that there should not be a large contrast of shade with illumination in the same room. Light should be directed to the object observed, but shaded from the eyes. It is, he says, often overlooked that, while the work is brightly illuminated, the rest of the room is dark. He thinks the contrast leads to discomfort, which can be avoided by having the rest of the room moderately illuminated. Dr. F. W. Edridge-Green, F.R.C.S., too, urges that the lighting should be uniform, and strong contrast avoided. A bright light which can catch the eye is particularly to be avoided. In the opinion of Dr. A. S. Cobbledick, the position of the light is not enough considered; and its proper arrangement is very difficult where many clerks are working in one room.

A suggestion made by Dr. E. E. Maddox, F.R.C.S.Ed., is that compositors, who are apt to have gas-lights before their eyes only a foot or two away, should have them screened with small metal plates fixed to the burner, and reflecting the light on to the work. Speaking generally, Dr. Maddox thinks almost everything in a workshop should be whitened, and the lighting should be partly direct on special work and partly indirect; the source of light being shaded from the workers' eyes. The floor and benches should not be whitened, nor, if all the workers face in one direction, should the wall facing them be too white. On the same point, Mr. W. Beaumont, M.R.C.S., does not think enough use is made of the contrast of black and white. It is used in books—black type and white paper; but it should be carried further. The carpenter should have a black bench, and the lace-maker a black pillow, &c.

It is stated in the report that all answers to the fourth question deal practically with various applications of electric lighting—a point which, it may be recalled, was commented upon in the "Electricity Supply Memoranda" when dealing with the appendix.

Fine Work and Eyesight.

A letter was addressed to five operative associations concerned with trades in which the nature of the work might involve injury to eyesight. In this letter, an invitation was extended to furnish the Committee "with the necessary information to enable them to trace among the members of the Association or elsewhere any specific cases of injury to eyesight caused by working with insufficient light or with a badly arranged system of lighting."

On behalf of the weavers, the Association stated that they were not prepared with specific cases of bad eyesight caused by bad lighting; but at various times complaints had been made by weavers at certain mills of having to follow their work under great difficulty, on account of the bad lighting. For the lace-makers, it was stated that a large percentage of superannuated members had quite good eyesight. In their time they would have had at least two lights to machines which were only two or three yards wide, whereas to-day machines five or six yards wide were being worked with only two lights, to say nothing of the additional speed of the machines.

Illumination Measurements in Factories.

A number of records are given in one of the appendices, which were obtained during the winter months, at the instance of the Committee, in order to reveal as far as possible the lighting conditions under which some of the chief industries of the country are carried on at the present day. The actual observations were made by Mr. J. W. T. Walsh, B.Sc., of the National Physical Laboratory, and Mr. G. F. Sedgwick; and the Committee acknowledge their indebtedness to them for the thorough way in which they carried out their work. It is pointed out, however, that the records must not be regarded as giving more than a very general idea of lighting conditions in certain representative factories in the engineering, textile, and clothing industries. The relatively short period each day during which factories are working under artificial light affords only a limited opportunity for observations after dusk; but use was made of practically all the available time over which such observations were possible. Though they would have liked to be able to obtain a much larger number of observations, the Committee express the opinion that, for the chief industries studied, the average results now given would not in most cases have been much affected had a greater number of observations been available.

Previous to taking the measurements, a tour of inspection in each

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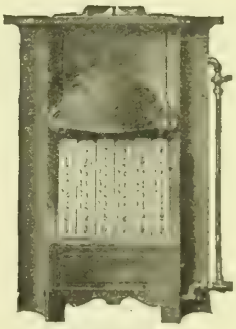

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of the districts chosen was made by one of the Secretaries to the Committee, who selected factories both well and indifferently lighted. There were 54 factories dealt with, many of which were too extensive to permit of the taking of observations in all the rooms. The method adopted in these cases was to choose rooms which were as far as possible representative of the lighting conditions throughout the whole factory. In the main, attention was directed to the illumination of floors and gangways and at the point where work was being carried out; the measurements being made by placing the white test-card at the observation point and measuring the illumination. In the case of measurements in gangways and on floors, the card was placed on the floor at one or two representative positions. It is remarked that the illumination at any point by artificial light is in ordinary circumstances a fairly constant quantity. Though changes are liable to occur owing to fluctuations of the supply pressure, or to accumulations of dirt on the lamps and fittings, in well-regulated installations fluctuations due to such causes are not great; and the recorded observations may be taken as showing definitely the illumination at the various points by artificial light. With natural lighting, the matter is otherwise.

Measurements of the artificial illumination at floor-level were made in nearly all the factories visited. While it was found that in the majority of cases attention was paid to the general illumination of workshops by providing a certain number of lighting units for this purpose, in some instances no such provision was made—the lighting units being placed solely with the object of illuminating some point of work, and the floor illumination being left to chance. Sometimes this procedure yielded fairly good results in practice; but often it was found to lead to unsatisfactory, or even dangerous, under-illumination of certain parts of the rooms where no work was being carried on, but over which it was necessary for workpeople to pass. The mid-points of the curves—*i.e.*, the points above and below which equal numbers of observations lie—for floor illumination by artificial light in each class of factory visited are: Foundries, 0·4 foot-candle; engineering shops, 0·6 foot-candle; weaving sheds, 0·4 foot-candle; lace and hosiery factories, 0·35 foot-candle; clothing workrooms, 0·85 foot-candle; and spinning mills, 0·6 foot-candle.

Eleven weaving sheds were visited. In the majority of cases the lamps were shaded by enamel or opal shades of the ordinary shape. The usual method of placing the lights is to have one lamp over every pair of looms, or in cases where the candle power of the lamp is higher one over the centre of every group of four looms. The usual height of the lamps is from 5 to 7 feet—in other words, as low as possible without causing inconvenience to the operatives moving about under them. It is pointed out that with such an arrangement as this, it is clear that the ordinary form of shade is unsatisfactory on account of the glare due to the rows of bare lamps seen on raising the eyes from the looms. The improvement in this direction due to the use in some cases of metallic reflectors was very noticeable. The mean illumination at the loom varied in the different factories from 0·98 foot-candle to 8·7 foot-candles—the remark attached to the latter figure being, "Lighting very good." A curve embodying the results of all the observations on the looms "indicates a decided leaning towards an illumination of between 1 and 2 foot-candles at the surface of the cloth on looms;" while practically the whole of the floor-lighting curve lies below the 1 foot-candle point.

There were 22 rooms included in the observations of spinning, &c., processes—the systems of lighting met with including batswing burners, incandescent upright and inverted mantles, high-pressure gas, and electric glow lamps. In many cases where no special lights were provided to illuminate the gangways, they were found to be very badly under-illuminated. Observations made at the actual points of work varied from 0·11 foot-candle to 5·6 foot-candles. Curves prepared from rooms with machinery show that there is a considerable diversity in the values observed, with a tendency towards an exceedingly low illumination in many mills. Observations at spinning mules, while indicating less diversity, gave over 60 per cent. of tests below 0·5 foot-candle. Measurements at floor-level gave 22 per cent. of observations below 0·25 foot-candle, and 84 per cent. below 1·5 foot-candles.

In lace factories, ten rooms were visited, two of which were lit by electric incandescent lamps, four by high-pressure gas [in one case with a subsidiary system of electric lighting], and four by batswing burners. In the great majority of lace machine rooms the chief *desideratum* is a moderate general light over all the working parts, and the possibility of producing a high local illumination at any particular spot when required. For this purpose, the most suitable system of lighting seen consisted of counterweighted lamps, capable of being readily pulled down and directed towards any particular point which it was desired temporarily to illuminate. It is desirable that the lamps should be shaded. The one hosiery factory visited was lighted mainly by electricity; and the illumination produced seemed to be generally sufficient. But the lighting units were so placed that the workpeople, while tending their machines, were compelled sometimes to stand in their own light. An observation taken on the machine with the operative in his normal working position gave an illumination of 0·15 foot-candle, while the unobstructed illumination averaged 1 foot-candle. Here, again, more local lighting seemed desirable; and adjustable lights would undoubtedly have been a considerable convenience. The average floor illumination in this factory was about 0·5 foot-candle. A few observations in examining and mending rooms showed that the illumination varied from 0·3 foot-candle to 4·5 foot-candles, with an average of 2 foot-candles. The mid-points of the curves are approximately: Lace machines, 0·7 foot-candle; lace factory floors, 0·35 foot-candle; hosiery machines, 1·3 foot-candles; winding machines, 1 foot-candle.

The total number of general engineering shops [excluding foundries] in which measurements of artificial illumination were taken was 43; and the lighting systems met with included batswing burners, ordinary upright and inverted incandescent gas, high-pressure gas, electric glow lamps [used both for local and for general lighting], and arc lamps. It was noticed that as a rule the same general system of lighting prevailed throughout all the shops in each factory. In several factories

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where arc lamps were used, the lights seemed to be hung too low to give the most satisfactory general illumination. In this way, "dense black shadows were often formed;" and in one instance these were complained of. There was also one complaint of glare, owing to the low position of the lighting units. When electric glow lamps were used for local lighting, "they were often, but by no means always, efficiently shaded." The shades used for the lamps illuminating vices, and for bench work generally, were mostly of the ordinary enamelled iron form. It is remarked that probably in many cases parabolic or similar specially designed shades would give more satisfactory results. For illuminating machines, such as lathes, where the local light had to be close to the work, the most satisfactory kind of shade appeared to be of a conical form. The measurements of illumination at the point of work covered a very wide range. A curve relating to machine work shows that there is no very definite illumination which is regarded as the best for this kind of work. While about one-third of the observations were below 1 foot-candle, there was an equal proportion above 2·5 foot-candles. So that the middle one-third of the observations were between these figures. Approximately 8 per cent. of the observations were above 10 foot-candles. In connection with bench work, the observations were so distributed that approximately one-third were below 1·25 foot-candles, one-third between 1·25 and 3 foot-candles, and the remaining one-third all above the latter value. This distribution indicates that bench work is allowed a higher degree of illumination than machine work. There were 6 per cent. of the observations above 10 foot-candles. The curve for heavy work—such as forging, spring making, rolling, &c.—is somewhat indefinite, owing to the limited number of observations available; but the uncertainty indicated by the two previous curves as to the degree of adequate illumination does not appear here to the same extent. Over 50 per cent. of the observations were between 0·75 foot-candle and 1·75 foot-candles. The curve for floor illumination in all classes of machine-shops shows only about 24 per cent. of observations above 1 foot-candle or below 0·4 foot-candle; so that an illumination between these limits is that most commonly met with. The mid-points of the different curves are approximately: Machine work, 1·6 foot-candles; bench work, 1·8 foot-candles; heavy work, 1 foot-candle; and floors, 0 6 foot-candle.

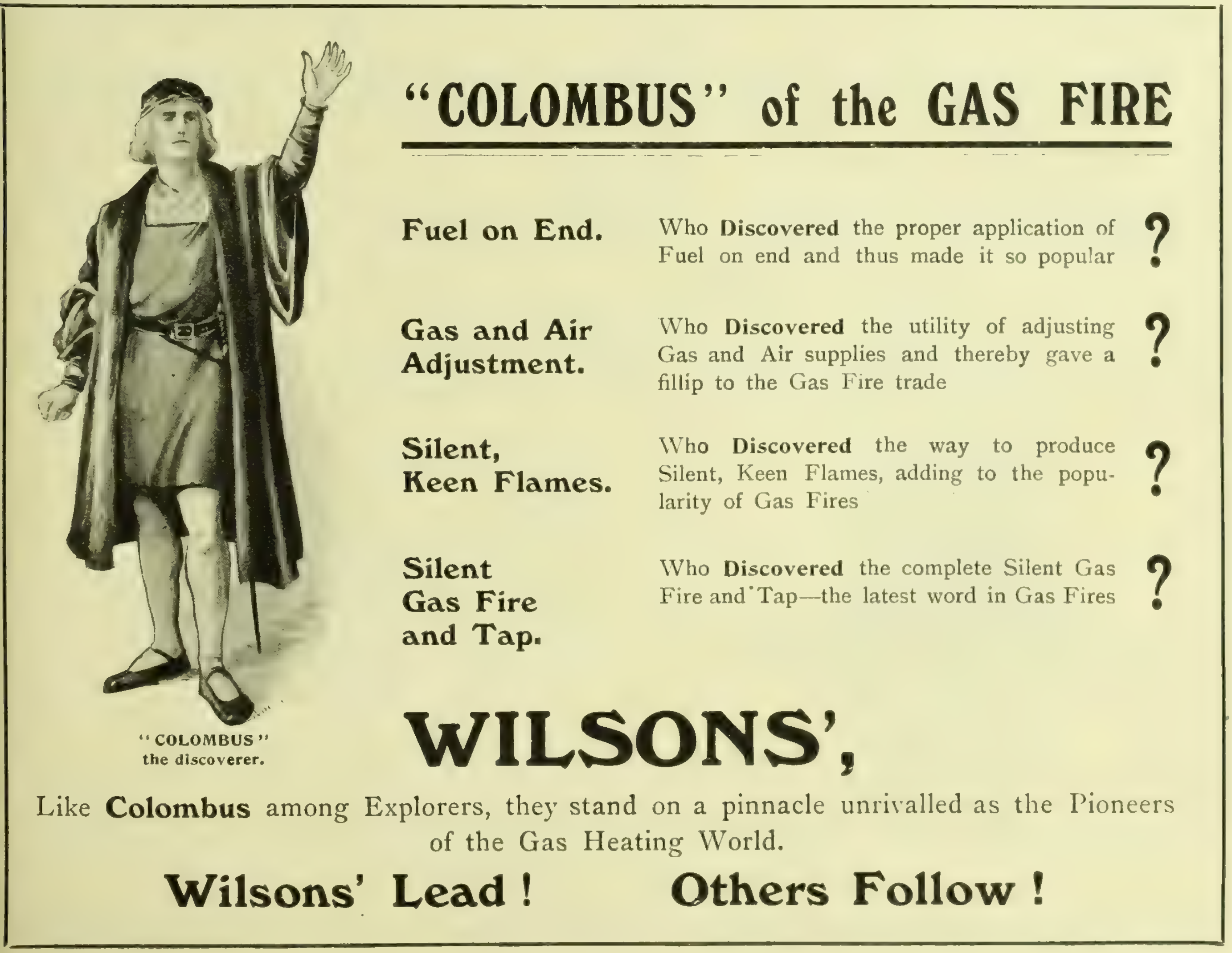
The artificial lighting of eighteen foundries was investigated. The main system employed was arc lamps in eight cases, high-pressure or ordinary incandescent gas in three, electric glow lamps in four, and batswing burners in three. Seven of the foundries had local lighting by gas and electricity, in addition to the main system. In many instances the lighting seemed generally sufficient; but it appeared particularly bad in those foundries lit mainly by batswing burners, some parts of which were clearly dangerous. The chief disadvantage of lighting by isolated powerful sources—especially in foundries with low roofs—is, it is remarked, the dense black shadow cast by every object in the neighbourhood of a lamp. This makes it extremely hard to see the nature of the ground which happens to be in such a shadow; and it has been stated that accidents arise from this cause. It is particularly necessary that the passages and gangways of foundries should be well illuminated; otherwise there is always some likelihood of treading upon hot metal which has been spilt in transit, but is no longer visible by its own incandescence. Measurements taken at the floor or other place of moulding or casting ranged from 0·19 foot-candle to 2·3 foot-candles. The mid-point is approximately at 0·4 foot-candle.

The total number of clothing workshops and sewing rooms in which measurements were made was 37; and the lighting systems met with included batswing burners, upright and inverted mantles, glow lamps, and indirect lighting by inverted arcs. Good results may be obtained from any of these systems except the first. With sewing-machines, the light-sources were generally placed several feet away from the point of work; one source often serving to illuminate several machines. In only two factories was any attempt made at systematic localized lighting. In one of these, a small electric glow lamp in a metallic reflector was fixed to each machine close to the work, so that the light was directed almost entirely on to the needle of the machine or its immediate neighbourhood; in another, an electric lamp with enamel shell shade was provided for each machine on an adjustable arm. In only one room were deep metallic reflectors fitted so as effectively to screen the lamps, which in all other instances were either unshaded or else fitted with opal or enamel shades of the ordinary shallow conical shape. The uncomfortable and glaring effect of this arrangement of lamps was referred to when dealing with weaving sheds. The mid-points of the curves for the lighting for different kinds of work are approximately: Sewing upon coloured materials, 3·6 foot-candles; cutting and pressing, 2 foot-candles; sewing on white linen, 2·5 foot-candles; and floors, 0·85 foot-candle.

In seventeen unclassified rooms, in which observations were made, the systems of lighting met with included batswing burners, inverted mantles, and electric incandescent lamps. The illumination at the point of work ranged from 0·25 foot-candle to 8·4 foot-candles.

DAYLIGHT ILLUMINATION.

The observations dealt with here, of course, refer only to artificial lighting conditions; but similar measurements were made in daylight. The next appendix also deals with the latter aspect of the question; but it is unnecessary to complete this notice of the appendices to the report by any detailed account of what is set forth. Messrs. C. C. Paterson and J. W. T. Walsh remark that the proportion of outside light reaching a point inside a building is seldom as much as one-tenth, and more often lies between one-hundredth and one-thousandth. That is to say, the illumination outside a building may be a thousand or more times as great as that simultaneously existing within. In spite of this very large difference, however, it will be found that on a bright summer day, when the outside illumination is of the order of 5000 foot-candles, work can be quite comfortably carried on at a bench within a building where the illumination is only one-thousandth of this amount. Furthermore, the eye does not perceive a very marked difference in passing from outside to inside the building, or *vice versâ*.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DUTCH AND GERMAN INCANDESCENT MANTLES.

[From the "Ironmonger," Sept. 25.]

In an editorial article in the "Ironmonger" of July 10,* we questioned the right of the N. V. Gautsch Gasgloeilicht Maatschappy (Incandescent Gas-Mantle Company), of Amsterdam, to be regarded as a business of Dutch nationality. The Company sells a considerable part of its output to a few large buyers in this country; and our information was that the money paid to it went, not into Dutch but into German pockets. We alleged:

1. That the business was a branch of a German company.
2. That its shares were in German hands.
3. That its chief proprietor was actually serving in the German Army.
4. That the works had been erected in Holland since the outbreak of war.
5. That twenty-five young women were brought over from Germany to manufacture the mantles in Holland.

Our statements brought us a letter from Mr. C. Engel, the Managing-Director of the Company, which appeared in our issue of July 31.† Mr. Engel declared that practically the whole of the share capital of the Company was owned by Dutch subjects; that "the young Mr. Gautsch" who is serving in the German Army was not connected with the business in any way; and that the business had been established in Holland twenty-five years or more. In view of these positive disclaimers we felt that a frank apology was due to the Company; and we published such an apology unasked in the same issue in which appeared Mr. Engel's letter.

Further information which has reached us causes us to return to the subject now—not to question the truth of Mr. Engel's assertions, so far as they go, nor to deny that some of the assertions made in our article of July 10 were inaccurate and misleading, but because it appears to us that, if the Company wishes to continue to sell its goods in the British market while a state of war prevails, it is desirable that some further light should be shed upon its operations and its business connections.

It appears that the late Mr. Carl Gautsch was a German who settled in Holland in the year 1879, and after various ups and downs started a business in incandescent goods about the year 1889. This business apparently consisted purely—at the beginning, at any rate—in importing such goods from Germany and selling them in Holland and in England. It was, in fact, a merchant's business. Mr. Gautsch married a Dutch widow, a lady of means. Whether he was ever naturalized in Holland, we do not know. In the year 1905 he converted his incandescent-mantle business into a limited liability company, with a capital of 250,000 fl. (about £21,000), and with himself as Managing-Director. He retired from that position in 1909, and in 1913 he died. The bulk of the shares in the Company now appear to be in the hands of Mr. Gautsch's widow, who survives him, and of her daughter by her first husband. Mr. Engel, who is a Dutchman, is Managing-Director of the business. The Mr. Gautsch who is serving in the German Army appears to be a nephew of the originator of the business, and was, we understand, in the employ of the Company until he was called up for service.

The present undertaking of the Company includes a large incandescent-mantle factory at Sloterdyk, on the outskirts of Amsterdam, employing over a hundred hands. The workers, we are informed, are principally of Dutch nationality, although several responsible employees are German. There is also a lamp-works at Zalt-Bommel, in Holland; but this is a small affair, in which no more than about twenty people are employed. We appear to have been accurate in stating that the Sloterdyk works were started since the war began. In fact, it seems that it was the shutting-out of German mantles from direct exportation to the British market that caused the management of the Gautsch works to take a lease of the premises. Mr. Engel's contention that "this modern factory, completely fitted up according to the latest principles, was not merely put up to serve during the war," may be quite correct; but it is equally correct, we think, to say that if there had been no war there would have been no "Amsterdam Little-Glow-Stocking Factory" (to translate the quaint Dutch style of the works literally) at Sloterdyk.

The Dutch nationality of the principal shareholders in the concern, of the Managing-Director, and of the majority of the workpeople, may be admitted to be established, and so is the fact that manufacturing operations on a large scale are carried on at the works, and that the Company is a reputable and well-established undertaking. The points upon which further enlightenment is desirable are these:

Was the Gautsch firm acting as agent for the Auer Company, the great German incandescent firm, up to August, 1914?

Did the Auer Company in August and September, 1914, send to the Gautsch firm large quantities of machinery, very large quantities of raw material for the manufacture of incandescent mantles, and particularly of thorium, and a number of German artizans skilled in the manufacture of incandescent goods?

Does this machinery form part of the present plant at the Sloterdyk works; has the raw material been used there for manufacturing purposes; and are the German artizans employed there now, or have they been so employed since the war began?

Is it a fact that, soon after the Auer Company had consigned the aforesaid large quantity of thorium to Holland, the German Government prohibited the exportation of thorium, and that

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* Reproduced in the "JOURNAL" for July 13, p. 91.

† An almost identical letter was addressed to the "JOURNAL," and appeared in our "Correspondence" columns of July 27, p. 194.

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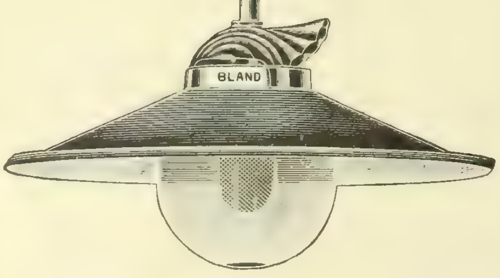

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Price of Round Globe with Bayonet Fixing.
Clear, 18s. 6d. doz. Obscured, 19s. doz.
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MADE FOR LOW OR HIGH PRESSURE.

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LONDON and MANCHESTER.

the Government Commissioner who issued the prohibition is a Director of the Auer Company?

Finally, has the Gautsch Company any connection, direct or indirect, with the German Auer Company?

It is said that almost the whole of the products of the Gautsch Company are sold to a few British firms, and we understand that in authoritative quarters much interest is felt in the matter of the firm's supposed relationships with the Auer Company. A representative well known in the incandescent-light trade of this country has recently been sent by the British Government to Holland to investigate the incandescent mantle trade generally, and particularly to find out whether any relations exist between the Gautsch Company and the German Auer Company, and, if so, what they are. The report of this representative, which is shortly expected, should help to clear matters up.

WAR BONUS QUESTION AT OLDHAM.

Gas and Water Workers Tender "Sympathetic" Strike Notices.

Over 500 notices to cease work were tendered to the Town Clerk of the Oldham Corporation last Wednesday, on behalf of the members of the Gas-Workers' Union. The departments principally affected are the gas and water; and these aggregate nearly 800. A fortnight's notice is necessary before work can be relinquished.

The Town Council, on a general application for an advance in wages to the lower-paid workmen, granted an advance of 2s. per week to men earning less than 30s., and such advance as would not bring their earnings to more than 30s. per week. Men earning 30s. and upwards were not to receive the advance, except those who had had an increase automatically by advances being granted to skilled men employed in similar work in the district. A ballot was taken of the members of the Union on the question as to whether they were in favour of the tendering of notices to the two Committees to cease work, in order to obtain advances for all workmen. The voting resulted in an instruction to send in the notices.

With the notice was enclosed a statement by Mr. J. R. Clynes, M.P., General Secretary of the Union, in which he said there were about 300 men in the Gas and Water Departments who, by exceptional service, could earn more than 30s. per week; and no settlement could be reached if these men were deprived of any advance similar to that which might settle the claims of other workmen. The men had felt themselves driven to tender notices because the Corporation had declined either to submit the claim to arbitration or to agree to a conference which had been suggested. With few exceptions, the whole of the wage-earning classes in Oldham had already received advances. Many other corporations in Lancashire and the country generally had given advances to all their workmen; and Oldham men could not submit to worse terms than other places. The Corporation had already given an advance of 3s. to all the higher paid artizans in the skilled trades suffering from the heavy increase in the cost of living. Where more than 30s. was earned, it was not because of ordinary labouring service, but because of special skill or additional work on Saturdays, Sundays, and night-shifts. Corporation workers were willing to share any burden that advances to workmen might entail, but were not willing to forfeit their right to advances most other ratepayers had now obtained.

COKE AS A MOTOR FUEL.

Drawing attention to the claims of coke as a fuel for steam-waggons and tractors, the "Commercial Motor" points out that its heat value is but some 14 per cent. lower than that of the best Welsh steam coal; while not only is Welsh coal high in price and likely to remain so, but some sorts are distinctly inferior in quality to those which were available at the outbreak of war. So far as our contemporary can see, "coke is likely to remain low in price, by reason of the virtual cessation of export in not a few directions. The keenness with which the London Coke Committee are arranging to establish depôts in and around the Metropolitan area augurs well for the future of this fuel. The threat of additional taxation upon motor spirit, which cannot fail to revive interest in the alternative of steam-wagons and tractors, will undoubtedly help the numerous gas undertakings which have at last fully realized that a big potential market is open to them. Welsh coal has many and admitted advantages; but we can write from experience, with fleets of steam-waggons which were worked solely upon coke, that the claims of Welsh steam coal must not be wrongly elevated to the point of becoming a fetish. If half the steam-waggons and tractors in the country worked on coke, a consumption of more than 3000 tons a week should be the experience."

In an article on the subject of motor fuels, "Motor Traction" points out that the grading of coke is now well organized by most of the important Metropolitan and Provincial gas companies for steam-raising and other purposes. The grade giving the highest rate of combustion with a minimum of draught is that which will pass a 2-inch square mesh screen and over a ¾-inch screen of the same section. The writer says: "With the development of the water-tube boiler, the use of gas coke as fuel becomes practicable, owing chiefly to the larger proportion of grate area per unit of effective heating surface usually provided with this type of boiler; and now, after many years of pioneer experimental work, the coke-fired water-tube boiler has definitely established its claim to recognition. That there are thus two kinds of smokeless fuel available for the steam-driven vehicle, both being home products, is matter for satisfaction. This fact removes the uncertainty as to supplies in the future which attaches to the petrol motor, and the possibility of combinations of proprietors imposing unreasonable prices, as one is a natural and primary product of the coal-mining industry, while the other is an unavoidable bye-product of coal-gas manufacture."

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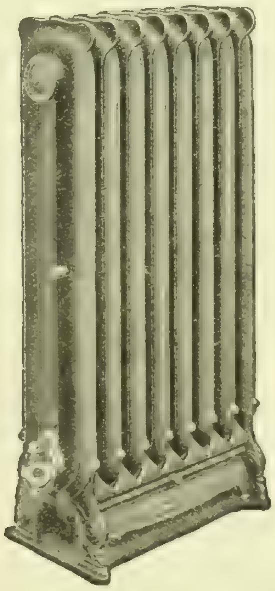

ARDEN HILL & CO., Acme Works, BIRMINGHAM.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

At a meeting of the Special Committee on Coal Supplies appointed by the Corporation of Glasgow, a deputation was received from the Lanarkshire Coalmasters' Association, who explained the effect of the Price of Coal (Limitation) Act, 1915, on prices at the pithead. The view expressed by the deputation was that the full maximum allowed by the Act would be added to the prices existing in the corresponding periods of 1913-14. It was remitted to the Convener and Clerk to prepare a report and recommendations to be submitted to the Corporation, after approval by the Committee.

Estimates for the current year, submitted to the Gas Committee of the Perth Town Council by ex-Bailie Wright, the Convener, showed that it was intended to retain during the whole of the period the price of gas at 3s. 6d. per 1000 cubic feet, and not make an increase of 6d. in November, as had been anticipated. This satisfactory result, he said, had been obtained by the unexpected reduction in the price of coal, owing to the rebate which will be received under the Prices of Coal Act passed in the last session of Parliament, and also by the increased revenue obtained from residual products. For trade purposes, the price of gas is to be fixed at 2s. 11d. per 1000 cubic feet, with discounts varying from 2½ to 10 per cent. on consumptions ranging from 100,000 to 1,000,000 cubic feet per annum.

At a meeting of the Valuation Committee for the County of Aberdeenshire—Lord Provost Taggart presiding—an appeal was heard of the Aberdeen Parish Council against the proposed valuation of £11,566 on the Aberdeen Gas-Works. They asked that the sum should be fixed at £20,226. The Lord Provost intimated that the Magistrates, having heard the arguments of the parties and considered the matter, were of opinion that the decision in the Arbroath case confirmed the practice of arriving at the rent or annual value on the basis of the revenue of the preceding year, and accordingly sustained the entries made by the Assessor, and dismissed the appeal. The Magistrates, on application by the Council, agreed to state a case.

The Thurso and North of Scotland Gas Corporation, Limited, have appealed against the valuation placed on their undertaking, and have had it reduced by £132. Mr. J. B. Scott, the Manager of the Cowdenbeath Gas-Works, appeared on behalf of the Corporation. Mr. Scott also appeared for the Oban and District Gas Company, who, as recorded last week, were successful on appeal in getting their assessment reduced by £100.

A complete reconstruction has been effected at the Maybole (Ayrshire) Gas-Works. A new retort-bench has been erected, of three ovens—two containing five retorts each, and six retorts in the third. They have been fitted throughout with new mouthpieces, ascension-pipes, and steel hydraulic main; also a steel foul-main round the retort-house, carried by wrought-iron hangers from the roof principals. The foul-main is furnished with a new steel valve, and carried outside the retort-house and connected-up to the condensers. The condensers have been reconstructed, and raised 2 feet above the ground level, and thereby rendered more accessible for cleaning purposes. The retort settings are of the most modern type, on the shallow regenerative principle; the hot coke being drawn direct into the furnace below through a steel shoot. The cost of the reconstruction has been £1000. The work was carried out by Messrs. R. S. Workman, of Saltcoats, to plans prepared by Messrs. Fairweather, of Kilmarnock.

At their meeting last Monday, the Aberdeen Town Council had a prolonged debate on the question of increasing the charges to the electricity consumers. The Electricity Committee recommended that the increase be 15 per cent. all round. The Council, however, by 20 votes to 10, rejected the Committee's recommendation, and decided that the charge for current for lighting (including public lighting) be increased by 10 per cent., and the charge for motive power (including heating and lighting) be increased by 25 per cent. A letter was read from the Board of Trade pointing out the importance of every effort being made at the present time to accumulate stocks of coal, as, owing to the number of miners who have joined the colours, the supply of coal for home consumption next winter will be less than usual.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Sept. 27.*

There is nothing of particular interest to record in the tar products market, and values generally are about the same as last week.

Makers' quotations for 25 per cent. sulphate of ammonia remains unaltered at £14 8s. 9d. per ton net, filled into buyers' bags, at makers' works.

Tar Products in the Provinces.

Sept. 27.

There is little alteration in the markets for tar products. Pitch still keeps quiet, and transactions are few. Solvent and heavy naphthas are in good demand. Creosote is still very quiet, and reasonable prices are being accepted.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 3d. to 25s. 3d. Pitch, East Coast, 21s. 6d. to 22s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 22s. to 23s. Clyde. Benzol, 90 per cent., North, 10½d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Coal tar crude naphtha, in bulk, North, 6½d. to 7d. Solvent naphtha, naked, North, 1s. 11d. to 2s. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2⅞d. to

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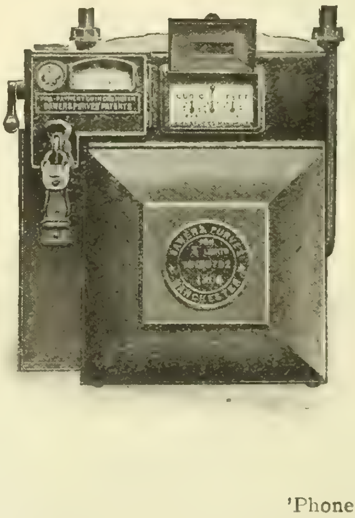

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Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Sept.* 25.

During the past week the market for this article has been very quiet, and at most ports lower prices have been accepted. Direct orders from buyers abroad have been scarce, and dealers have evidently had sufficient supplies in hand to meet their present requirements. The closing quotations are £14 8s. 9d. per ton f.o.b. Hull, £14 11s. 3d. f.o.b. Liverpool, and £14 13s. 9d. f.o.b. Leith. The dullness in the near position has now affected forward delivery, and it is reported that business has been done f.o.b. good ports at £14 12s. 6d. per ton for October-December, and at £14 17s. 6d. for January-June.

Nitrate of Soda.

This market has remained firm throughout the week; and although the value of ordinary quality is still 13s. 4½d. per cwt., that of refined has advanced to 14s. 4½d. per cwt.

Sulphate of Ammonia.

From another source it is stated that there has been no alteration in the market during the past week, although in some quarters lower prices are reported to have been accepted. Outside London, makes are quoted at £13 17s. 6d.; Hull, £14 7s. 6d.; Liverpool, £14 7s. 6d. to £14 10s.; Leith, £14 12s. 6d.; Middlesbrough, £14 7s. 6d. to £14 10s.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade seems rather stronger; and the prices are firmer in some cases. Licences to export appear to be more freely given, though steamers are still somewhat scarce. In the steam coal trade, there have been some governmental orders placed, which are making collieries a little brisker. Best Northumbrian steams are from 17s. 6d. to 18s. per ton f.o.b.; second-class steams are 16s. to 16s. 6d. per ton; and steam smalls are quiet and plentiful in the supply at 12s. to 14s. per ton f.o.b., according to the quality. The output is now more nearly taken up than it was; and the pits are working full time, except in a few instances. In the gas coal trade, the demand is now steadily growing, both for home and foreign needs. Best Durham gas coals are quoted at 19s. per ton f.o.b., and this price has been paid for early delivery. Second-class qualities are steady at 16s. 6d. per ton; and a contract for coal of this class is reported for the next three months at 16s. 6d. for a fair quantity. "Wear Specials" are firm at 20s. to 20s. 6d. per ton f.o.b., and deliveries are fairly good. With the increase in the home demand, and some improvement in the exports, the gas coal trade seems to be a little more promising than it has been. But the rates of freight are higher—9s. to 9s. 6d. being paid for gas coal Tyne to London; and at even the higher of these figures there have been fixtures. The coke trade seems to be steadier, with fuller exports. Good gas coke is a little more plentiful; but 28s. 6d. to 30s. per ton f.o.b. from the Tyne is still quoted.

Rise in Price at Whitby.—The Directors of the Whitby Gas Company have given notice to consumers that, as from the 1st prox., the price of gas will be increased 2d. per 1000 cubic feet, to 3s. 9d. This step has been forced upon the Company by the increased price of coal which is having to be paid. Fractional parts of 1000 cubic feet will be charged as follows: 100, 5d.; 200, 9d.; 300, 1s. 2d.; 400, 1s. 6d.; 500, 1s. 11d.; 600, 2s. 3d.; 700, 2s. 8d.; 800, 3s.; 900, 3s. 5d. The quantity of gas supplied through prepayment meters for 1d. will be 19 cubic feet.

The Modern Gas-Fire.—In the course of his annual report as Chief Sanitary Officer for the Borough of Keighley, Mr. J. C. Dawes expresses the opinion that the enterprise of the Gas Committee in introducing into the town the latest and perfectly hygienic gas-fires has had something to do with a diminution of the smoke nuisance from domestic chimneys. These gas-fires are, he says, splendid; and a large number of them have been fixed. Those in use will be the cause of many others being purchased, so successful are they as heat producers. The new gas-fire is a great improvement on the older one, and is a source of much pleasure. Another important point about the hygienic value of gas-fires is that the gaseous impurities of coal are removed from the gas before it is delivered to the house; whereas with a coal-fire these impurities are poured out from the chimney top, not only being wasted, but in their turn destroying the surrounding vegetation.

Road Repairs at Okehampton.—At a meeting of the Okehampton Rural District Council, the Surveyor complained of the way in which the roads were being restored at North Tawton by the Devon Gas Association, who had been searching for leaks. He thought the gas-main at North Tawton was very unsatisfactory—being in some places only 12 inches below the surface of the road. He did not think it was possible for the Association to reinstate the roads in their original condition. The Clerk said the Association had written complaining of the loss of gas by leaking mains caused by heavy steam-rollers being taken over the roads. They were, therefore, given permission to break-up the roads to try and discover the leakage, provided they were reinstated to the satisfaction of the Surveyor. Mr. Whipham remarked that it was usual for the Council to do the work, and for the Gas Company to pay for it. It was decided to ask Mr. George Lane (the Secretary of the Association) to confer with the Surveyor.

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Doncaster Gas and Water Accounts.

The abstract of accounts just published by the Doncaster Borough Accountant (Mr. C. Hanson) shows that in connection with the gas undertaking the income during the year ended March 31 last was £53,149, as compared with the previous year's total of £51,864; while the respective totals of expenditure were £48,322 and £44,797—last year's surplus being £4827, as against £7067 for the preceding year. In connection with the water-works, the income was £25,824, as compared with the previous year's total of £24,771; while the respective totals of expenditure were £22,815 and £21,801—leaving a surplus of £3009 for the period under review, as compared with £3969 for the twelve months ending March, 1914. The amount paid to the Sheffield Corporation for interest, sinking fund, maintenance, and additional supply in connection with the Little Don Valley works was £9857, against £8789 during 1913-14. The unexhausted borrowing powers in connection with the water-works is £2200, and those in relation to the gas-works £1620. Upon the first-named undertaking there is £264,783 outstanding for loans; the gas-works' figure is £79,650.

◆

Dearer Gas at Sittingbourne.—The price of gas at Sittingbourne is to be increased to 3s. 11½d. per 1000 cubic feet—a rise of 2½d.

Increased Price at Goole.—It has been decided by the Goole Urban District Council to increase the price of gas from 3s. to 3s. 6d. per 1000 cubic feet.

Truro Gas Company.—Mr. J. James, presiding at the annual meeting of the Truro Gas Company yesterday week, said the dislocation of business brought about by the war had caused a reduction of income. It was only by the utmost vigilance that the supply of gas was maintained without restriction. Had they not held large stocks of coal and made fortunate purchases, there would have been a considerable increase in cost. At present they were paying 13s. 1d. per ton more than in 1911, which represented about £3000 per annum. Of this amount they would receive about one-half, through the increase in the price of gas. A new installation of vertical retorts had been brought into use the previous week, and so far it had worked satisfactorily. Dividends of 5 per cent. on the preference shares and 3½ per cent. on the ordinary stock were declared. Mr. S. J. Ingram (the Manager), replying to a vote of thanks, said the year had been exceptionally trying. There was not now remaining in the office a single member of the clerical staff who was with them in August last year; and more than 50 per cent. of the employees at the works had joined the Colours, and had been encouraged in every possible way to do their duty to the country. The installation of vertical retorts which had been put in unfortunately had German parentage; but only about £250 worth of the material was of German origin. Purely British labour was employed in the erection; but certain patented parts were German. It was working with success, and he had no doubt would quite fulfil the stringent guarantee given by the contractors.

Suspension of Gas-Appliance Hiring at Oldham.

Controversy may arise as to the wisdom of the decision of the Oldham Corporation Gas Committee to curtail the supply of gas-cookers and gas-fires to their consumers during the period of the war. At a meeting of the Committee last Wednesday, Mr. Arthur Andrew (the General Manager) submitted a report in which he recommended that the supplying of gas-stoves and gas-fires should be suspended during the war period. This, he said, was advisable in order to comply with the request of the Local Government Board that municipalities should economize wherever it was possible to do so. On a previous occasion, the Committee did not arrive at any decision; and he therefore now renewed the recommendation. He explained that, since the matter was last before the Committee, he had had an opportunity of speaking to the Chairman, who was not now opposed to the recommendation. The capital cost was between £1000 and £2000 per year. The expense of fixing cookers and fires was obtained from revenue. The department could receive applications for cookers and other appliances, if people chose to make them; but they would be held over. He suggested that the show-room should be kept open; it could be used to some extent as an office. The recommendation was adopted. Another recommendation was that the men from the distributing side of the department (outdoor workers, &c.) should be drafted into the works for the winter, instead of engaging additional labour, as is usual at this time of the year. Mr. Andrew spoke in favour of the proposition, and the Committee approved the course suggested.

◆

Bland Light Syndicate.—At the seventh annual general meeting of this Company, recently held at Little Trinity Lane, E.C., the Chairman (Mr. F. J. Gould) announced that the year's trading, in spite of many difficulties, had been a satisfactory one; and, as far as the Board were able to foresee, there was not any likelihood of the Company being adversely affected by the war. An interim dividend at the rate of 6 per cent. per annum for the six months ending Oct. 31, 1914, was paid in July last; and it was decided to make a further distribution at the rate of 10 per cent. per annum—giving a dividend of 8 per cent. for the year.

Lighting of St. Columb.—A letter from the Secretary of the Gas Company was read at the last meeting of the St. Columb District Council, protesting against a resolution passed by the Council at a previous meeting to decrease the hours of public lighting. The Secretary said that, in entering into a provisional arrangement last March for a renewal of the lighting contract for three years, the Company and the Council came to a distinct understanding that there was to be no curtailment of the hours; and the Company could not recognize the right of the Council to vary the conditions. Unless the Council were prepared to revoke the resolution, the Company would, at the end of three months, cease to supply gas to the public lamps. The Council decided to receive a deputation from the Company at a future meeting.

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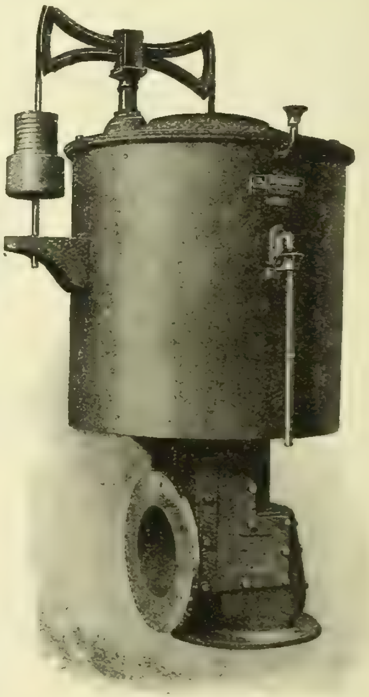

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Torquay Gas Company.

The half-yearly meeting of the Company was held last Tuesday, when it was stated that during the past six months the sale of gas increased by nearly 2 million cubic feet, in spite of the restricted public lighting, earlier closing of business houses, and the request by the Government to adopt economy in the management of domestic affairs. The increase in receipts was £2265. The total receipts were £21,280, and the expenditure £18,036. The sum available for dividend was £10,197. The half-year's dividend amounted to £3230; and this left a balance to carry forward of £6966. The Directors saw no immediate necessity for further increasing the price of gas. Mr. R. Beynon (the Manager) and Mr. J. Duckworth (the Accountant) were congratulated on having completed 30 and 21 years service respectively with the Company. The usual dividends of 10 and 7 per cent. were declared.

* * *

Notice of motion has been given by Mr. T. Rogers at the Trim (co. Meath) Urban Council for letting the gas-works, on the grounds that the Auditor's report showed they were not being worked on a satisfactory basis, and that a previous report indicated a considerable loss.

Todmorden was partly in darkness on Saturday night, owing to the electric light suddenly failing in the centre of the town—causing much confusion and inconvenience. The mishap occurred at the busiest time of the evening, when the streets were crowded with people.

The Metropolitan Water Board have accepted the offers of a number of firms to renew their contracts for a further period of six months to supply cast-iron pipes and irregular castings at 17s 6d. per ton advance in prices, except in the case of one concern that offered a 5 per cent. advance.

The Directors of Glover and Main, Limited, have declared an interim dividend at the rate of 5 per cent. per annum on both the preference and the ordinary share capital of the Company.

It is reported by the "Chemical Tade Journal" that during 1914 there was produced in Italy 4000 metric tons of sulphate of ammonia, valued at £46,600. The production during 1913 was 3784 metric tons, valued at £51,140.

We are asked to mention that, at their last meeting, the Directors of the Yorktown and Blackwater Gas Company appointed Mr. Henry J. Randall as their "Engineer and Manager," instead of "Engineer and Works Manager" as heretofore.

A fire in the floor of the operating-box of a Bradford picture theatre, was stated to have been caused by the fusing of an electric cable. A number of films were destroyed; but fortunately the fireproof character of the operating-box prevented the flames spreading to the remainder of the building.

APPLICATIONS FOR LETTERS PATENT.

13,048.—Bentley, J. E., "Gas-governors." Sept. 13.

13,076.—Buckley, C. A. M., and Olsson, C. M. T., "Gas-producers." Sept. 13.

13,253.—Wellington, S. N., "Discharging coke." Sept. 16.

13,254.—Wellington, S. N., "Charging retorts." Sept. 16.

13,292.—Simmance, J. F., "Automatically controlling processes which produce gas." Sept. 17.

13,300.—Roots, J. D., "Incandescent mantle lamps." Sept. 17.

GAS COMPANIES IN THE STOCK EXCHANGE.

The Stock Exchange has had a quiet week, and a dull one too into the bargain. Of course, the chief thing in everybody's thoughts has been the Budget and how it will affect market values. An extraordinary and gratifying feature is the general approbation with which it has been received, formidable and far-reaching though it be. Holes are being, and will be, picked in it here and there—over half-penny postcards, for instance—but in the main it is a very big success. The Germans are bragging about their War Loan; but bearing in mind the curious German methods of obtaining "subscriptions" on paper, it is quite another question how much of it is "money." Our Budget will produce hard cash. Prices in the Stock Exchange markets last week were nearly all lower. The War Loan became easier by fine gradations. Home Rails were quite depressed for reasons public and notorious; and even munition and armament concerns had something of a set-back, though accounts to hand show that some of them are making very big war profits. Canadians were about the strongest line—splendid harvest prospects being confirmed. Americans were fair. The negotiations for the loan are believed to be going along nicely. Shipping concerns closed firm. It may be noted that the powers (referred to in our last issue) sought by the board of one company to enable them to reject undesirable transfers were granted at the shareholders' meeting. Business in the Gas Market was quiet and colourless, and the bargains marked were not suggestive of any change of tone. A few issues, not frequently dealt in, however, came into notice. The Money Market was not at all active, but indications pointed to increased firmness

Bargains done for cash during the week were as follows: On Monday, Alliance and Dublin debenture 64½, 65, Continental Union preference 50, Gas Light ordinary 78½, 79, ditto debenture 62⅞, Primitiva debenture 65. On Tuesday, Gas Light ordinary 78½, 79, Primitiva 2½, ditto preference $3\frac{17}{32}$, South Metropolitan 77¼, 77¾, South Suburban 85. On Wednesday, European 12½, 12¾, San Paulo preference 8⅞, South Metropolitan 76½, Tottenham "B" 102½, Wimbledon 104½, 105. On Thursday, Gas Light ordinary 78¼, 78½, ditto preference 72⅝, 72⅞, ditto debenture 62½, 62⅞, Imperial Continental 59½, 60, 60½, South Metropolitan 77¼, Tottenham "B" 102. On Friday, Continental Union preference 46, Gas Light ordinary 77½, 77¾, 77⅞, ditto debenture 62, 62⅜, 62½, Imperial Continental 59¾, Primitiva preference $3\frac{5}{16}$. The Exchange was closed on Saturday.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING SEPT. 25.

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d	
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59—64	3 18 2	..
874,000	,,	July 10	4	Do. 4 p.c. Deb.	76—79	5 1 3	64½—65
280,000	5	April 29	7½	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	..
50,000	10	Feb. 26	16	Bournemouth Gas and Water 10 p.c. . .	29—30	5 6 8	..
873,480	10	,,	7	B 7 p.c. .	15—15½	4 10 4	..
95,000	10	,,	6	Pref. 6 p.c.	13½—14	4 5 9	..
—	—	—	—	Deb. . .	..	—	..
880,000	Stk.	Feb. 26	14	Brentford Consolidated	261—266	5 5 3	..
830,000	,,	,,	11	Do. New . . .	204—209	5 5 3	..
50,000	,,	,,	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	91—93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	,,	,,	8	Do. A Ord. Stk. .	154—159	5 0 8	..
530,000	20	Mar. 26	12½	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	Do. 4½ p.c. Pref. .	4—6	—	..
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106—108	5 1 2	..
560,000	,,	,,	5⅛	Do. 3½ p.c. do. .	103—105	5 1 6	..
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	..
800 000	Stk.	,,	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	,,	,,	7	Do. 7 p.c. Pref.	115—118	5 18 8	46—50
—	—	—	—	Croydon B and C 7 p.c.		—	..
492,270	Stk	—	6	Derby Con. Stk. . . .	123—125	4 16 0	..
55,000	,,	—	4	Do. Deb. Stk. .	102—104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd. . . .	17½—18	5 11 1	12½—12¾
3,362,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke 4 p.c. Ord. . .	98—102	4 15 6	77½—79
2,600,000	,,	,,	3½	3½ p.c. max. .	76—79	4 8 7	..
4,062,235	,,	,,	4	4 p.c. Con. Pref.	96—99	4 0 10	72⅝—72⅞
4,674,850	,,	June 11	3	3 p.c. Con. Deb	72½—74½	4 0 6	62—62⅞
130,000	,,	,,	10	10 p.c. Bonds .	..	—	..
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	16¼—16¾	6 11 4	..
—	—	—	—	Hornsey 7 p.c. . . .	..	—	..
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C . . .	151—154	5 2 4	..
65,780	,,	,,	6⅜†	Do. B	115—118	5 8 0	..
65,500	,,	June 26	4	Do. 4 p.c. Deb. . .	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental .	150—160	5 12 6	59½—60½
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119—121	5 7 5	..
561,000	Stk.	Feb. 26	10	Liverpool 5 p.c. Ord. A	211—213	4 13 11	..
718,100	,,	,,	7	B	146—14	4 14 7	
306,083	,,	June 26	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	..
£			p.c.			£ s. d.	
75,000	5	June 11	6	Malta & Mediterranean	4⅛—4⅝	6 9 9	..
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	Monte Video, Ltd. . .	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	98½—99½	4 10 6	..
529,705	Stk.	June 26	3½	Do 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14—15	5 2 8	..
800,000	Stk.	May 14	8	Oriental, Ltd. . . .	117—122	6 11 2	..
60,000	5	Mar. 26	10	Ottoman, Ltd. . . .	7¼—7¾	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B . .	128—131	4 19 8	..
100,000	50	,,	12	Do. C . .	118—121	4 19 2	..
52,000	50	,,	10	Do. D . .	..	—	..
249,980	5	April 29	8	Primitiva Ord. . . .	5½—6	6 18 4	2⅛
499,960	5	June 26	5	,, 5 p.c. Pref. .	4¾—5	5 0 0	$3\frac{5}{16}$—$3\frac{17}{32}$
521,600	100	June 2	4	,, 4 p.c. Deb. .	91—93	4 6 0	65
—	—	—	—	,, ,, ,, 1911	..	—	..
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½—11	5 9 1	8⅞
125,000	50	July 1	5	5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	223—224	4 9 8	..
209,984	,,	,,	10	Do. B	222—224	4 9 8	..
523,500	,,	,,	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	South African . . .	10½—11½	7 16 6	..
6,429,895	Stk	Feb. 12	5/4/0	South Met., 4 p.c. Ord.	111—113	4 16 8	76½—77¾
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	..
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114—116	5 8 8	85
60,000	,,	,,	5	Do. 5 p.c. Pref. .	110—112	4 9 3	..
—	—	—	—	Do. West Kent. .	..	—	..
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord. . .	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c. .	135—138	5 8 8	..
742,275	,,	,,	6†	B 3½ p.c. .	115—117	5 2 7	102—102½
181,255	,,	June 26	4	4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd. . . .	5—6	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93—95	5 5 8	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	,,	,,	6⅞	,, B 3½ p.c.	129—134	5 2 7	..
108,075	,,	,,	5/17/8	,, C 3½ p.c.	110—115	5 2 0	..
352,000	,,	,,	6⅛	Wimbledon 5 p.c. .	117—122	5 0 5	104½—105
98,000	,,	,,	6⅝	Epsom 5 p.c. . . .	121—126	5 5 2	..
88,416	,,	June 26	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

* Ex Div.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

SUPERINTENDENT. Sheffield Gaslight Company. Applications by Oct. 13.

ASSISTANT ENGINEER. Sheffield Water Department. Applications by Oct. 22.

GAS MANAGER. Llandudno Urban District Council. Applications by Oct. 11.
CHEMIST. No. 6100.
CARBONIZING FOREMAN. No. 6098.
WORKING FOREMAN. Abertillery Gas Department.
JUNIOR DRAUGHTSMAN. No. 6097.
CLERK. No. 6101.
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YARDMAN. Ammanford Gas-Works.

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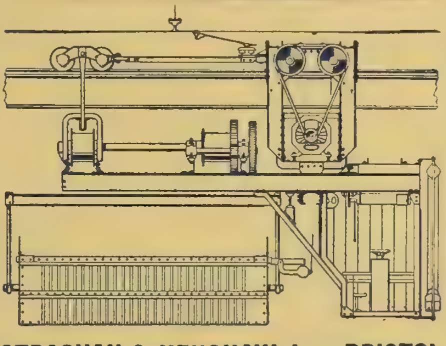

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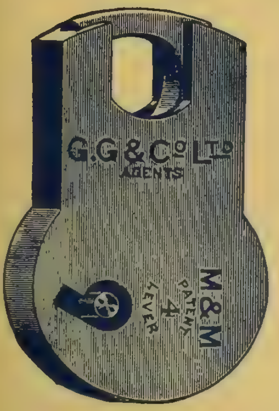

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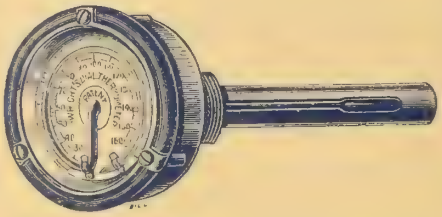

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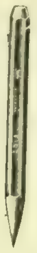

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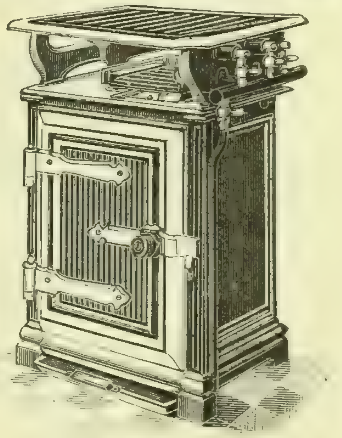

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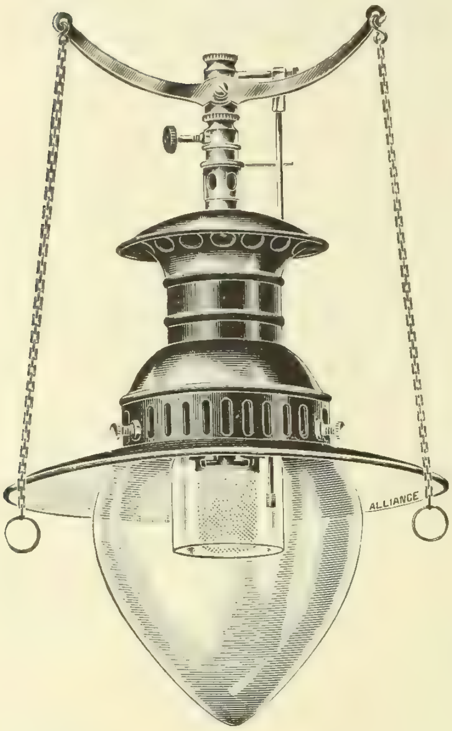

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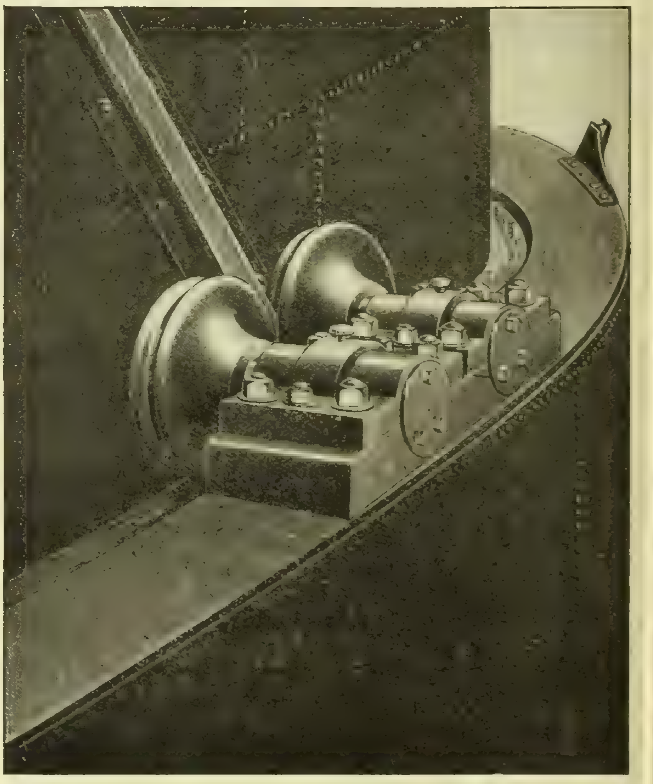

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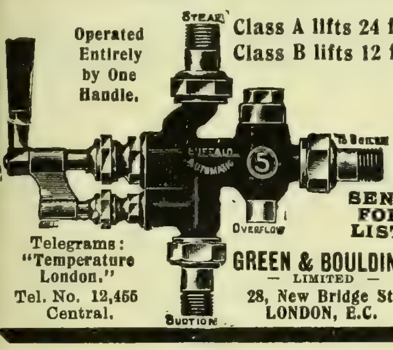

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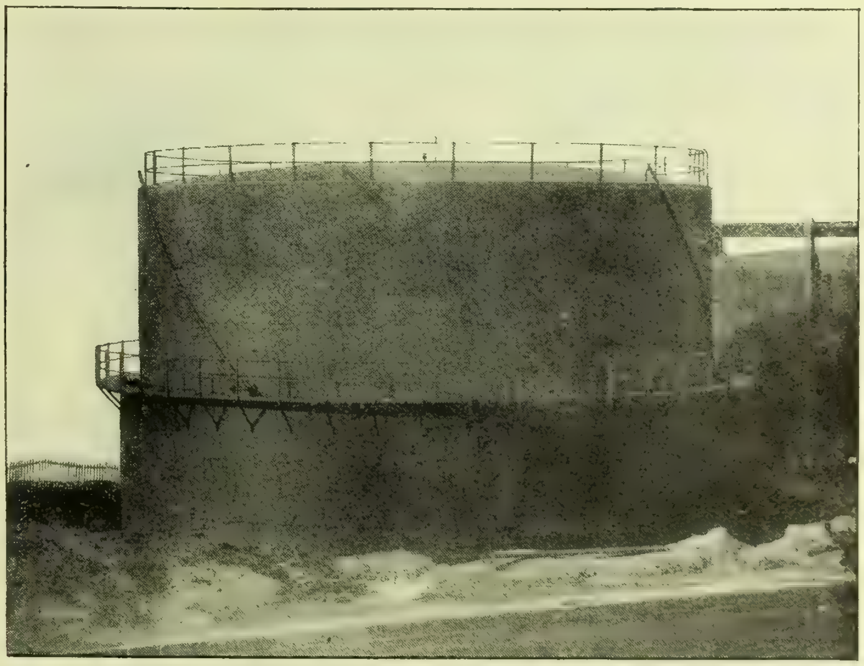

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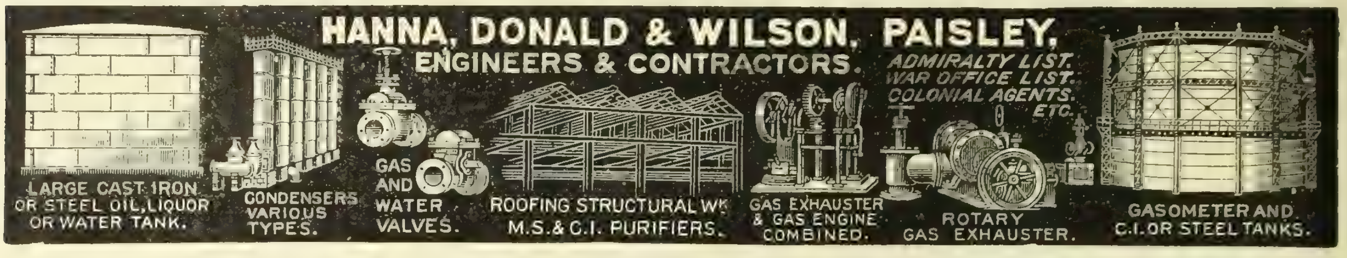
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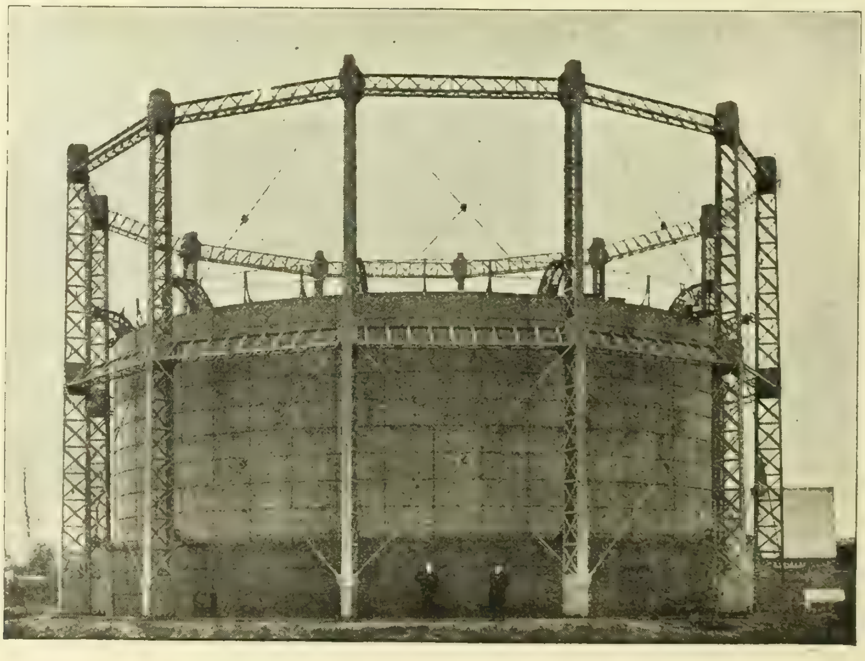

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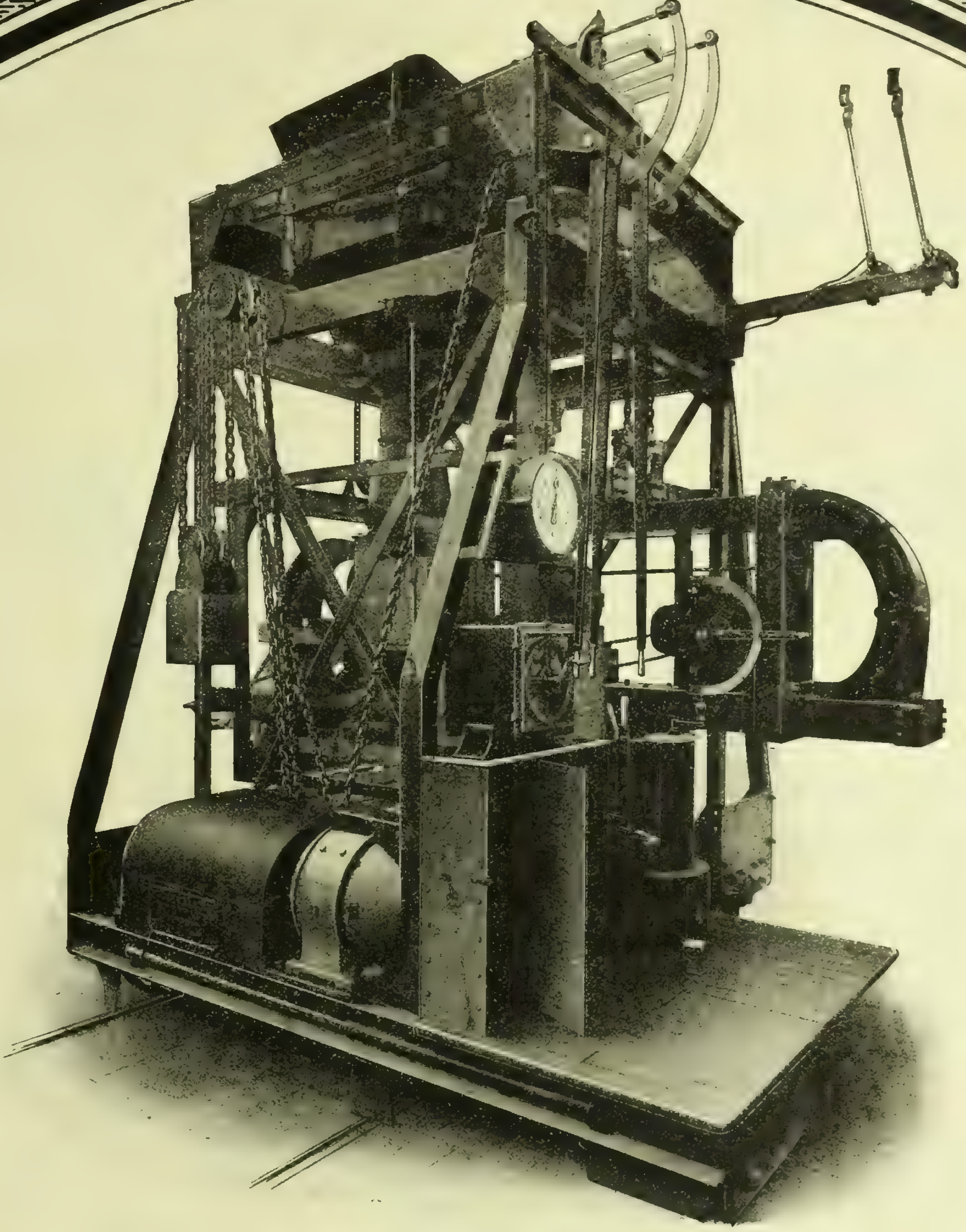

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LURGAN	¼	,,
HELENSBURGH	½	,,
SYDNEY (N.S.W.) 1st installation	1¾	,,
2nd ,,	1¾	,,
3rd ,,	6	,,
BRADFORD	2	,,
FITCHBURG (U.S.A.) 1st installation	¼	,,
2nd ,,	¼	,,
NEWCASTLE (N.S.W.)	1	,,
BELFAST 1st installation	2½	,,
2nd ,,	5½	,,
NELSON 1st installation	1¼	,,
2nd ,,	1¼	,,
BLACKPOOL 1st installation	¾	,,
2nd ,,	¾	,,
STOCKHOLM (Sweden)	1½	,,
BERGEN (Norway)	¾	,,
NEWCASTLE-UPON-TYNE		
1st installation	2½	,,
2nd ,,	3	,,
HEYWOOD	½	,,
DARLINGTON	2	,,
OLDHAM	2	,,
BRIDGWATER	½	,,
SOUTHPORT	1¼	,,
CAMBUSLANG	½	,,
NOTTINGHAM	1½	,,
TIPTON	½	,,
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EXETER	1¼	,,
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HONG KONG (China)	¾	,,
BERLIN (Germany)	¼	,,
LIVERPOOL 1st installation	2½	,,
2nd ,,	2½	,,
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DUNOON	⅜	,,
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OTTAWA (Canada)	1½	,,
GRAYS & TILBURY	½	,,
BANGOR (Ireland)	⅜	,,
BRISBANE (Queensland)	1½	,,
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CARDIFF	2½	,,
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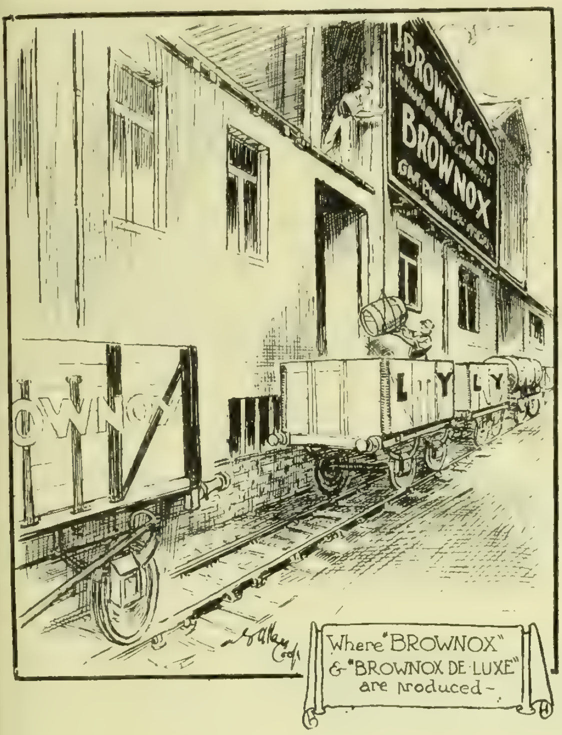
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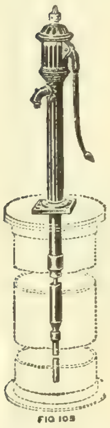


FIG 109

FIG. 84

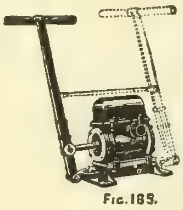
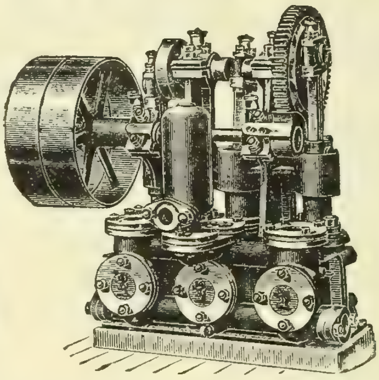


FIG. 183



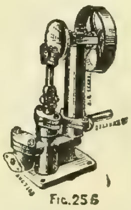


FIG. 256

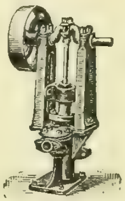


FIG 257

FIG. 69

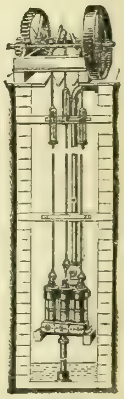


FIG. 328

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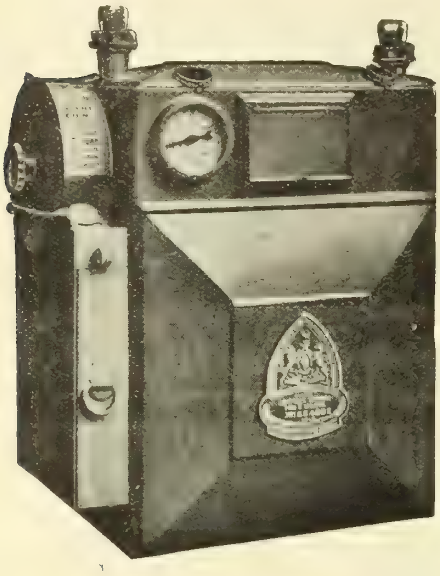

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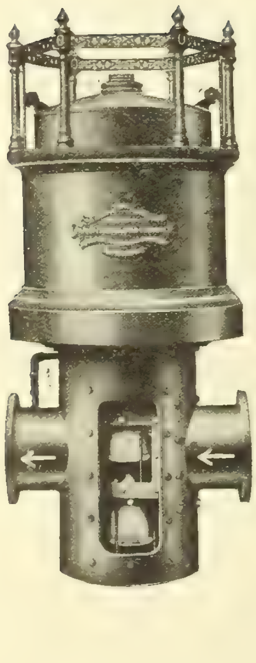

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WM. HAMBY.
Secretary.

Commercial Street, Sheffield,
Sept. 27, 1915.

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Canvassing will Disqualify.

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General Manager.

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Sept. 24, 1915.

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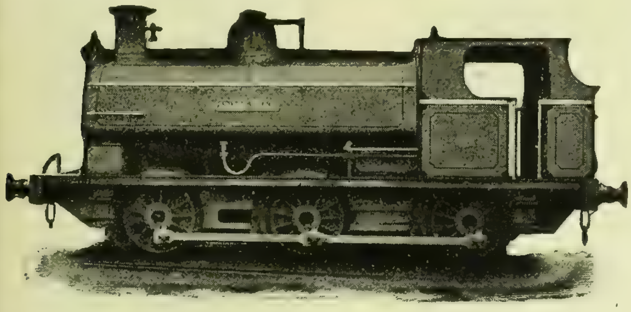

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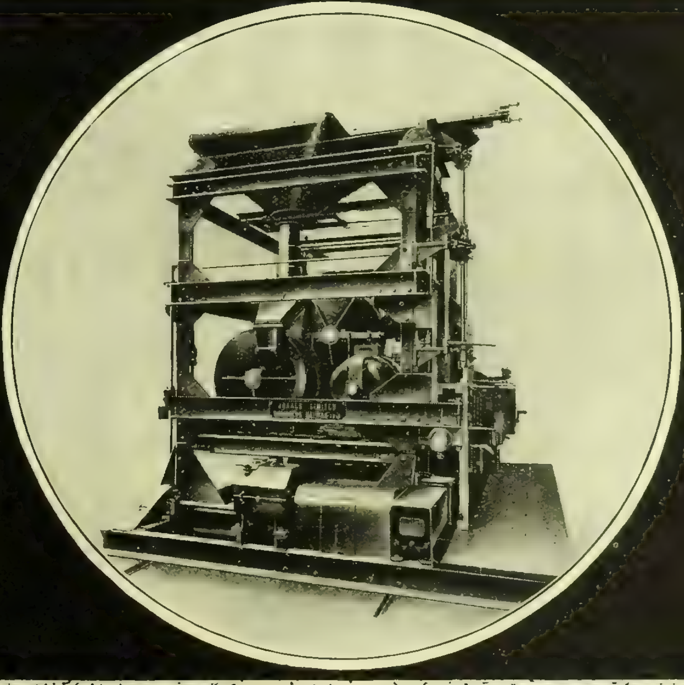

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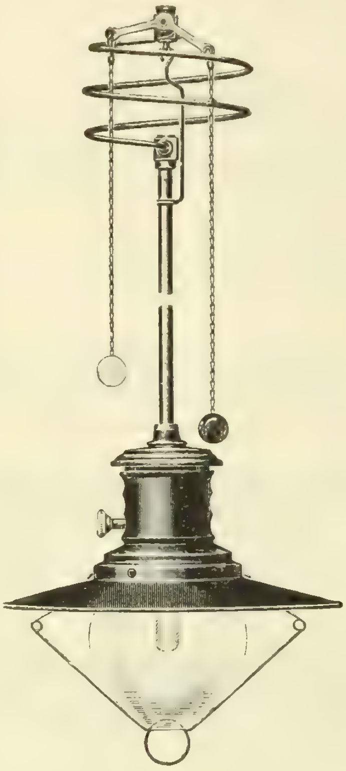

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